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AUGUST

1919

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Mercator's Map of the World, 1538. Facsimile in black-and-white, reproduced from the original in the Society's collection (only two original copies of this map are known). 1885.

THE
GEOGRAPHICAL REVIEW

VOL. VIII AUGUST, 1919 NO. 2

THE AWAKENING OF ALBANIA

By GEORGE P. SCRIVEN
Brigadier General, U. S. A.

It sometimes happens in the making of nations by decree, as appears to be the fashion in these days, that ideals and realities march side by side as they more often did in former and less complex times, when nations were born and not made. An instance of this stands out conspicuously among the peoples of today in the case of Albania, the almost unknown country of the Balkans that now asks recognition of its needs and claims. It is a small country, not important to the world as a state but vastly important to the peace of the family of nations; a country whose needs and desires go hand in hand with the history and geography and ethnology of its people, who for centuries have been the orphans of Europe, as homeless in the family of nations as the winds on their own mountain tops; a people without government, without ties, almost without friends, yet that from time immemorial have held fast to their motherland and their homes in spite of the seeming control of other nations. These are the Shkypetars, the "Men of the Mountain Eagle," of whom their great countryman, Ismail Kemal Bey,[1] says: "They have proudly preserved their independence, of which no power could deprive them. On the fall of the Roman Empire they reappeared on the world's stage to prove that they were of a race whose solidarity time could not affect and whose national genius custom could not prevent; today they display the singular and interesting spectacle of a nationality preserved pure and undefiled through the centuries in spite of so many successive conquests by Romans, Byzantines, Normans, Bulgarians, Serbs, Italians, and Turks."

[1] An Albanian of Valona and chief of one of the oldest families in Albania. He was head of the provisional government in Albania when independence was declared in 1912. The quotation occurs in an article on "Albania and the Albanians" in the *Quarterly Review* (London), July, 1917, pp. 140-168.

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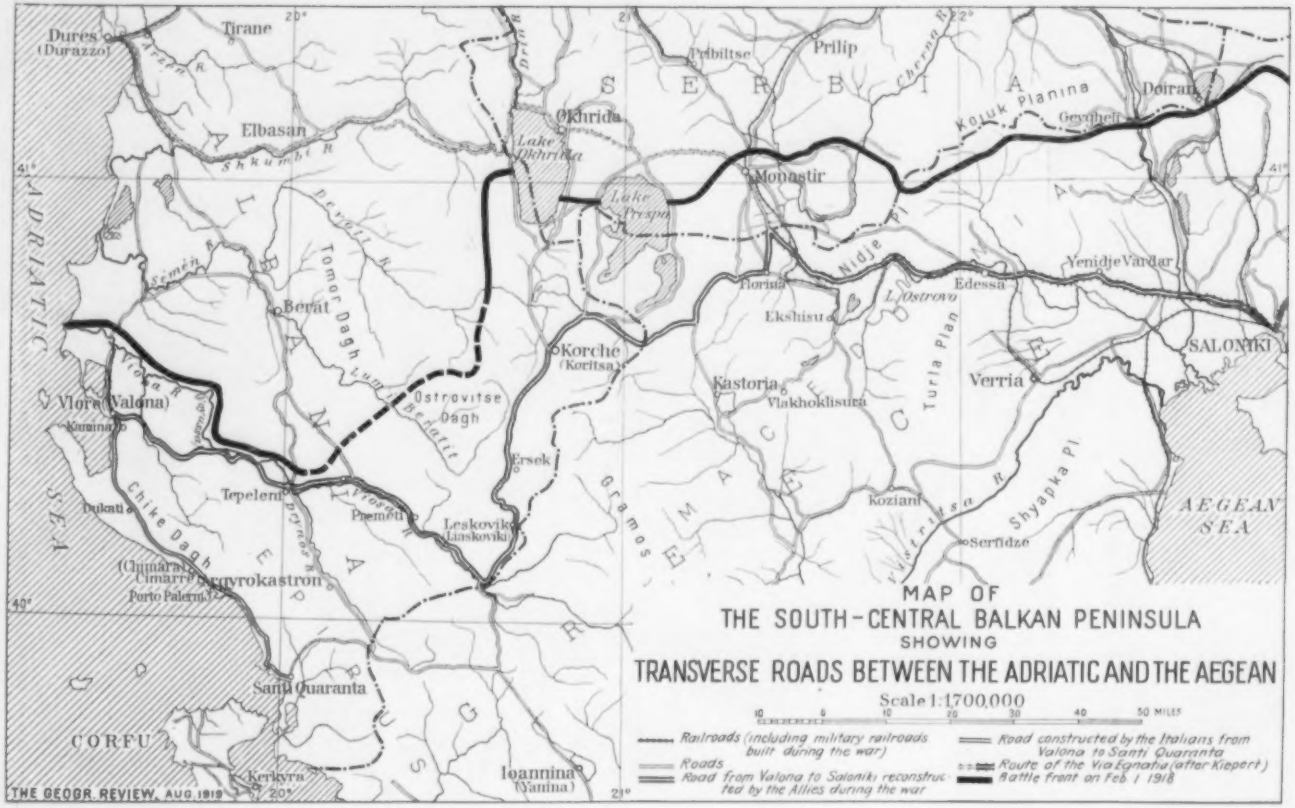
Dures (Durazzo)
Tirane
Elbasan
Berat
Vlora (Valona)
Kanina
Tepelenë
Premëti
Leskoviko (Liaskoviki)
Ersek
Korchë (Koritsa)
Ostrovitse Dagh
Tomor Dagh
Chike Dagh
Grammos
Smolika
Okhrida
Lake Okhrida
Lake Prespa
Monastir
Prilip
Prbiltse
Doiran
Gevgheli
Kotluk Planina
Nidje Pl.
Florina
Ekshisu
Kastoria
Vlakhoklisura
L. Ostrovo
Edessa
Venidje Vardar
Verria
SALONIKI
Turla Plan.
Koziani
Shyapka Pl.
Serridze
AEGEAN SEA
Santi Quaranta
CORFU
Kerkyra
Ioannina (Janina)
ADRIATIC SEA
MAP OF
THE SOUTH-CENTRAL BALKAN PENINSULA
SHOWING
TRANSVERSE ROADS BETWEEN THE ADRIATIC AND THE AEGEAN
Scale 1:1,700,000
10 5 0 10 20 30 40 50 MILES
Railroads (including military railroads built during the war)
Roads
Road from Valona to Saloniki reconstructed by the Allies during the war
Road constructed by the Italians from Valona to Santi Quaranta
Route of the Via Egnatia (after Kiepert)
Battle front on Feb. 1 1918
THE GEOGR. REVIEW, AUG. 1919

FIG. 1

The Albanians: Their Virtues and Their Faults

Of probably pre-Hellenic origin, the Albanians have remained as unmixed a race as any that exists in Europe. They are a people who possess in a high degree the basic virtues that make for stability and respect with nations as well as with men. Of them it may of a truth be said that they are courageous; honest and loyal to country, to family, and to the stranger that is accepted within their gates; they honor their women and their homes and, if bitter in enmity, are faithful in friendship; even the vendetta, of which they are accused, has its honorable side, for they fight openly without treachery. Their very faults are those of a proud people who have inherited a beautiful land coveted since history began by powerful neighbors against whom they have always been compelled to fight. What wonder, then, that the troubled and isolated lives of these mountaineers and their age-long struggle for freedom have rendered them restive under control and interference, intolerant of strangers, and indifferent to an outer world which tradition and history tell them is their enemy or at best a self-seeking friend? Their faults, such as they are, mark a phase in the evolution of a strong people; and through such phases have passed, not so far back in history, some of the best of the world's nations. In the future no doubt others will so pass to take their place in the family of nations. Why not the Albanians? For them the hour has struck; freedom from the smothering rule of the decadent Turk and the light let in by the great torch of war have awakened the minds of the people, quickened their energies, and shown them the need of nationality, unity, and intercourse, without which their country will remain a cancer in the Balkans and a source of infection to all Europe.

These things Albania should have; she deserves a better fate than to be left longer to the contempt and neglect that have nearly always been her lot. For Albania is a country as beautiful as fairyland and as rich as the fabled realms of Prester John, but it is as unknown as the heart of Africa and as ill defined.

Extent and Boundaries of Albania

To the people of the West, Albania is a word, a geographical expression indicated on the map as an ill-defined region of the eastern Adriatic, lying north of Greece, south of the Serbs, within the former Austrian sphere of influence, and extending inland over a chaos of mountains to the limits of heterogeneous Macedonia. It is seen as a sparsely settled country of hills and valleys, of rivers and lakes; but of its fertility and charm, of its people and their manner of life, little has been told except in recondite works on its history, its language, and the origin of its people. These works, for the most part treating of the days before Albania had thrown off the stagnant rule of the Turk and before war had brought in the soldier of the occupation, though interesting as studies, throw little light upon the

FIG. 2—The town of Legdushi, between Tepeleni and Porto Palermo: a typical scene in Epirus.

Albanian of today or upon the problems that now confront the people. The first of these problems is the extent of their own country, which has existed without boundaries, or with boundaries so ill defined that no man needed to recognize them until they were outlined by the London Conference of 1913. This conference, according to Albanian authority, "gave to Albania a territory of about 11,000 square miles, while more than one-third of her population and territory was given away to Serbia, Montenegro, and Greece. But at the present time supreme efforts are being made by the Albanian government, nobly supported and seconded by the United States, to recover the lost territories; and it is hoped that the Albania of the future will have an area of about 20,000 square miles with a population of about 2,500,000."[2]

That these efforts are reasonable is evident from an official statement of a representative of England[3] made to his government some thirty years ago to the effect that "the district covered by the geographical expression [Albania] falls mainly within the two vilayets of Scutari and Janina but extends also in an easterly direction, beyond the watersheds of the mountains dividing the streams which fall into the Adriatic from those which fall into the Aegean Sea, and includes portions of the vilayets of Bistolia, or Monastir, and of the vilayets of Pristina, or Kossovo."

The Migrations of the People

But, whatever may be the extent of the real Albania or the boundaries accepted by the Paris Conference or by a future League of Nations, the region thus delimited will never outline all the country occupied by the Albanian people. For they, like other races, have wandered from their rugged mountains into less difficult lands. To the east they have mingled with the confused mass of people who make up Macedonia; to the south they have sought the sunny lands of Greece; and westward they have traversed the narrow waters of the Adriatic and occupied by scores of thousands the valleys of Italy and Sicily. Indeed some sixty thousand of them are now with us in the United States. But in all their wanderings it is certain that these people have preserved the fundamental qualities of their race and have remained the "Men of the Mountain Eagle" whom not even the Roman could bend wholly to his yoke.

Roman Relics and Traditions

The wanderings of these people began no doubt long before the galleys of old Rome visited the bays and inlets of the eastern Adriatic or her soldiers marched over the Via Egnatia. Along the coast, on the road, for instance, whose traces are still found near Porto Palermo, relics of Roman influence exist—a bridge here, a burial place there, or, most striking of

[2] From a letter of Mr. Constantine A. Chekrezi, representative in the United States of the Albanian federation Vatra.

[3] Lord Fitzmaurice, May, 1880.

FIG. 3

FIG. 4

FIG. 3—General view of Koritsa (Korche).
FIG. 4—A public well in Koritsa.

FIG. 5

FIG. 6

FIG. 5—Saliari, an Epirote hamlet.
FIG. 6—Part of Argyrokastron. The town is built on a hillside overlooking the Drynos valley.

all, the descendants of the men of the broken legion who still wander over the Albanian hills feeding their flocks in the valleys in winter or on the high hill slopes when summer comes. These are the pastoral Rumeni, who proudly reply when questioned: "I am of Rome." Of their origin they sing:

O ye, who know it well,
Who know us full well,
O ye flowery valleys,
Ye lofty mountains, speak,
Talk to the people;
Relate to us, pray,
From what country we came,
O'er what roads we traveled
To thee, O Pindus;
For the world is not yet
Conscious of us and does not know
All the truth.

Ye have come here from Rome
And have grown up here;
Remote was the time—
It is known to me only;
I saw ye when small
And know well ye are Latins,
And it is your language
(Which recalls Rome to me)
That I talk with the birds
Of the Apennines and with those
Who build their nests
Among my ferns and have
So sweet a song
That it melts all hearts.

Monuments and Ruins

To Venice, however, rather than to Rome, Albania of the Adriatic owes the best of its monuments. Graceful bridges still span the rivers, magnificent olive groves rise on many a hill, and a score of imposing castles of stone dot coast and hillside. Above Valona stand the grand ruins of Kanina. But these ruins are even surpassed by the remains of the giant castle of Argyrokastron which once dominated that quaint Old World town and the neighboring valley of the charming Drynos. At Porto Palermo the well-preserved works, half castle, half fort, still served in the war as a defense against the submarine; while at Vuno the Lion of St. Mark, rudely carved in the living rock, marks the love of the people of the city by the sea for this charming coast of the Adriatic. But there are other and far different ruins to be found in southern Albania, scores, perhaps hundreds of destroyed villages cover its hills; myriads of gray stone houses, once the homes of peasants, stand deserted by all but the storks; fertile fields remain untilled; mosque and minaret and church are broken ruins, and desolation broods over many a lovely scene.

But space is lacking here to tell of these things; of destroyed Liaskoviki; of ruined Dukati; of the relics of historic Tepeleni, lying between the rivers in front of the gorge of Klisura where the Roman once checked the barbarian advance. Nor can the pathetic ruins of the castle of the mighty Albanian, Ali Bey, be described here—a castle destroyed like others in the strife that followed the Balkan wars. Let the Albanian himself tell the story, and let the Greek listen to the Albanian's tale.

FIG. 7—Albanian irregular troops commanded by Italian officers.

EFFECTS OF TURKISH RULE

Of the Turk and his rule few monuments remain. Except in the matter of religion and obstructions to education and progress, he left but slight impression upon Albania. There is little to recall his centuries of government beyond a few unspeakable roads, unlovely buildings, and crumbling tombs.[4] In spite, however, of the traces of Rome that still exist in Albania, it is probable that no great impression was made by the people of the "boot of Europe" until the great emigration of Albanians into Italy after the battle of Kossovo, toward the end of the fifteenth century, when Greek, Bulgar, and Serb went down before the Turk, as well as the Albanian clans led by their hero Skanderbeg. Then it was that a further union of

[4] Ismail Kemal Bey, in speaking of Turkish influence, says: "In spite of the religious and other consequences of the Turkish domination, the Albanians have remained faithful to the customs and habits of their ancestors. Indeed, under the Turk the Albanian preserved many of his privileges and continued a semi-independence under his own chiefs."

the Pelasgic tribes became impossible. A good portion of them became converted to Mohammedanism; others took refuge in Italy; still others kept their religion and became subject to the Turk in appearance only.[5] Those who emigrated into Italy scattered; they adopted the language, customs, and dress of the new land in which they lived, but they never gave up their old country. In Calabria, in the Basilicata, and in Sicily live a hundred thousand of these people in scattered communities, distinct in race and language.[6] Among them is the Crispi family, from whom came the great statesman of Italy of twenty-five years ago.

Italian Influence

The influence of the Albanian immigration into Italy was considerable, especially upon the coast towns of the Adriatic and upon Valona, where Catholic Italians of Albanian origin gained considerable influence. This is an important fact to remember in studying the relations between Italy and Albania and the conflict between Italian and former Austrian interests centering at Valona. At the outbreak of the war Italy's chief interest in Albania lay in Valona both on account of the fact that a large number of representatives from her Albanian immigrants had returned to settle there and on account of the importance which she then—as now—attached to this great harbor lying in the Straits of Otranto. There were Italian colonies and traders at Durazzo and Skutari; but, in spite of the work of the Franciscans and of the Austrian and Italian schools founded for religious purposes, which used the language employed by the Jesuits for all Albanian church literature (Latin with four additional letters and Italian spelling), it does not seem probable that, behind the coast line, Italian influence was considerable. The Turks prohibited schools in the national language.

Effect of the War

Great has been the change in Albania brought about by the war. To the soldiers of Italy, France, and England, the writer believes, is due a great uplift in all the Balkan countries, and to the Italians especially the awakening of southern Albania from its sleep of centuries. Here Italian influence was at its height, and from here it will spread throughout the mountain lands. From here also first came the check to the German threat against the southern Adriatic. Had this advance not been checked in the early days of the war, it would have carried the hordes serving with the Austrian flag, as well as the Bulgars and possibly the Turks, far down into Epirus and into wavering Greece and would perhaps have made it impossible for the Allies to throw across the Balkans from Valona to the Aegean

[5] Frassari Adamidi: Les Pélasges et leurs descendants. *Bull. de l'Inst. Egyptien* (Cairo), Series 4, No. 3, 1902, pp. 5-15 and 45-57.

[6] See Alessandro Smilari: Gli Albanesi d'Italia: Loro costumi e poesie popolari, Naples, 1891.

Sea the armed wall from which fell the blow that at last broke down the German arch.

Of Italy's part in the war there is no occasion to speak at length here. It is enough to say that before the experimental Wied was called to his impossible task the Albanian stood at bay, exhausted by his struggle in the earlier wars, surrounded by a pack of hungry neighbors, and alone in his troubles. Then came the German war and with it the protecting arm of Italy. On Christmas day of 1914 the Tenth Regiment of the Bersaglieri landed at Valona, and the Italian soldiers advanced by stages to a junction with the French left flank at Ersek and brought Albania, from the Voyussa River to the Greek boundaries and from the Adriatic to the French sphere of influence, under their control. Then indeed the burdens of the Albanian of the south were lightened, and hope awakened. The Italians, under General Ferraro, brought them peace in the midst of war. He fed the starving people, gave them money for improving their lands, and built docks and roads such as Albania had not seen since the days of ancient Rome. Hospitals for the people were opened, schoolhouses were built, mail and telegraph service was instituted, and experimental farms were established. Not content with material assistance, the Italian soldier established courts where the Albanian, whether Moslem or Orthodox, was judged as an Albanian. Sanitation was looked to; religious beliefs were respected, the vendetta was abolished (or at least held in abeyance), and the peasants were disarmed. All this was done in the midst of war.

The Future

The time has come when Albania should be given a government and a place under such mandatary at first as shall be needed. She should then have the chance to develop her proper character—that of the Switzerland of southern Europe, in some respects, indeed, a more beautiful Switzerland than that of the northern Alps.

Let the Albanians of Albania decide their own future, for it is their right. Whatever may have been the changes wrought in the fringes of the country by the surrounding peoples during the course of two thousand years, the Albanians have remained a family bound by the unchangeable conditions that surround them and by the compelling facts of life. True, they are not and never have been a united family and have been forever embroiled by matters of leadership, of religion, and of policy; but their dissensions will pass away with time and growth as they have passed away in the case of other mountain peoples who have suffered from the same complaints in childhood as the Albanians. Like the Swiss, the Albanian is possessed of those fundamental virtues which, when the time comes, will surely give him his place in the family of nations to the great benefit of Europe and of the world. It is for Paris, or perhaps later for Geneva, to say when that time shall be; but come it must if the Balkans are to have rest.

THE SETTLEMENT OF TROPICAL AUSTRALIA

By GRIFFITH TAYLOR
Commonwealth of Australia Bureau of Meteorology

In the past twenty-five years man has rapidly extended his dominion over three great pioneering belts. The desert has been conquered to an extraordinary degree by the engineer and the farmer, the tropical forest has been invaded by the white settler, and the subarctic belts have seen a great increase in the number and size of permanent habitations. These conquests are in part the result of discoveries in the field of science, but in large part also they represent a changed mental attitude toward new or strange ways of life. Explorers who returned from the Arctic were expected to relate stories of intense cold and suffering. Was not the man who had lived in the tropics bound to be pale and weak from fever? The desert traveler had to have his tale of thirst. Men have always dramatized their adventures in exploration.

With every change in mental outlook and every great advance in science man does well to appraise his difficulties and opportunities anew. It is a service to mankind to offer fresh outlets for his energy and his spirit of enterprise and at the same time relieve that pressure for land and resources that impels him at times to make war as a supposed alternative to internal disorder or decay. An excellent study of Australia has just appeared and is of such outstanding importance that it is in part published below. It has been compressed into the space of an article by the editors, who are also responsible for the form in which it is published. It sets forth with great force and precision the problems of a large and thinly populated tropical region and is one of the best studies of its kind ever attempted.*

The Problem Stated

To the politician who makes a flying visit to tropical Australia in the most favorable time of year there appears to be "no reason why a thriving white population should not fill the tropical areas." The government official, usually engaged in promoting some branch of industry, has his accounts buried beneath a mass of advertising literature. It is useless to consult the bushman living wholly out of doors and following the most healthful occupation in the world: his opinion is valuable only as regards the conditions of pastoral life. In view of these difficulties it might not be amiss to study the facts comparatively and in a scientific spirit. What is tropical Australia? Will it support a large white population? What are the experiences of whites in similar climates elsewhere?

*Griffith Taylor: Geographical Factors Controlling the Settlement of Tropical Australia. *Queensland Geogr. Journ.*, Vols. 32-33, 1918, p. 1-67.

Political Divisions of Tropical Australia

Tropical Australia is divided, politically, among the three divisions of Queensland, the Northern Territory, and West Australia and constitutes 38.6 per cent of the area of the Commonwealth.[1]

The population, exclusive of aborigines, is distributed as follows: In Queensland there is a large tropical population of 160,000 persons, constituting 95 per cent of the whole tropical population and forming an important portion of the total for the state. In the Northern Territory 90 per cent of its small population, or 3,500 persons, are congregated in the warmer regions and hardly any in the relatively cooler inland areas. In West Australia less than 2 per cent, or 5,000 persons, are found in the enormous tropical areas.

A consideration of the reasons for these differences—which are natural and in accord with the logical principles governing the spread of population—will be found to give the key to the problem confronting us.

Elevation of Australia

Of all the six continents Australia has, by far, the lowest average elevation. Antarctica is largely a plateau over 7,000 feet high. Asia has her great Tibetan Plateau, and all the warmer regions belong almost generally to the highlands. America has an immense belt of great width running down the western side of the continent; while Africa, south of the equator, is almost wholly over 3,000 feet. The northern portion is, to be sure, somewhat low, and in many ways this northern African region offers the closest parallel to tropical Australia. Speaking generally, it is advantageous that temperate regions are low and tropical regions high. Australia, unfortunately, exhibits its chief highlands in the cooler regions—while the tropical portion is almost wholly below 2,000 feet.

The Topography of Tropical Australia

The Coast Lands

The topography of northern Australia (Figs. 1 and 2) includes a narrow belt of coast land, crossed here and there by streams of varying size, which, in the southwest, are mere chains of water holes except in the wet season. Around the Gulf of Carpentaria the lowlands have their maximum width of about one hundred miles. They are here crossed by a number of large rivers, one of which, the Roper River, is navigable for ninety miles by vessels drawing fourteen feet. There is a close relation between large rivers,

[1] Australia, including Tasmania, has an area of 2,974,586 square miles. It constitutes about one quarter of the British Empire and is nearly twenty-five times as large as the United Kingdom. It is this great size, taken together with the fact of the limited population (4,940,952 in 1914), that gives to the problems of Australian development their unique character.

wide lowlands, and heavier rainfall. The scenic aspect of the lowlands varies not only with their width and the relief of the country behind them but also with the vegetation. The shore is fringed by mangrove and ti-tree thickets. In the southwest there is desert country back of the shore, with patches of desert scrub as the only vegetation. Where the rainfall is greater there are grassy prairies, and toward the north-northeast, as about Port Darwin and along the eastern coast of Queensland, there are open eucalyptus, pine, and gum forests.

SUNDA ISLANDS
ARAFURA SEA
NEW GUINEA
TORRES STR.
THURSDAY I.
TIMOR SEA
MELVILLE I.
INDIAN OCEAN
Gulf of Carpentaria
CORAL SEA
PACIFIC OCEAN
Daly Waters
Darwin
Cardwell
Townsville
Mackay
Rockhampton
Brisbane
WESTERN AUSTRALIA
Desert
NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
Adelaide
Port Augusta
Wallaroo
Port Pirie
Broken Hill
Port Lincoln
Eucla
Kalgoorlie
Esperance
Albany
Geraldton
Carnarvon
Wyndham
Halls Ck.
Hall's Creek
Millstream
Onslow
Roebourne
Port Hedland
Derby
Broome
Fitzroy Crossing
Wiluna
Meekatharra
Yalgoo
Mullewa
Perth
Bunbury
Busselton
Albany
Esperance
Eucla
Ceduna
Streaky Bay
Port Lincoln
Kangaroo I.
Yorke Pen.
Spencer Gulf
Gulf St. Vincent
Port Augusta
Port Pirie
Wallaroo
Adelaide
Murray R.
Darling R.
Broken Hill
Lake Eyre
Lake Torrens
Lake Gairdner
Lake Amadeus
Lake Mackay
Lake Macdonald
Lake Nash
Lake Frome
Lake Callabonna
Lake Blanche
Lake Hope
Lake Yamma Yamma

The use of the moderately dissected upland country is difficult here and there where deep gorges must be traversed. In some places the dissection of the broad upland has gone much further than in the Kimberley region. For example in the Pilbarra region the upland rises to over 2,000 feet, with local highlands reaching to 4,000 feet, as at Mt. Bruce. The valleys are broad and the streams have cut the valley floors close to base level. This is an advantage from the point of view of communications along and across the valleys but would be less favorable for the grazing industry were it not for the greater elevation and the heavier rainfall induced thereby.

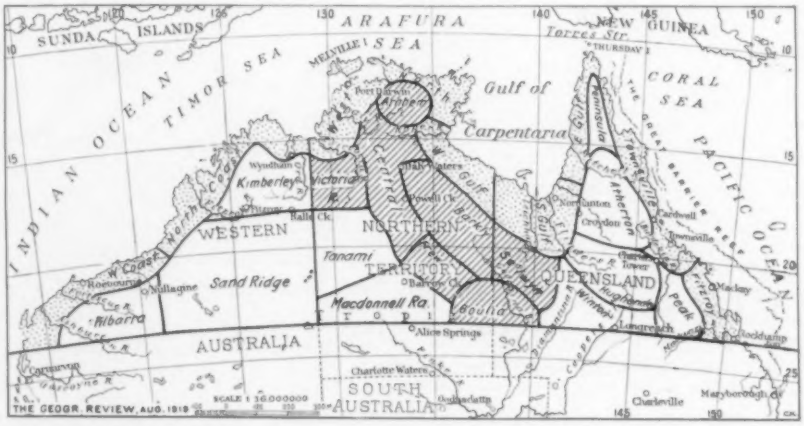

FIG. 2—Topographical divisions of tropical Australia. Coast lands are dotted, central uplands are ruled, western peneplane and eastern highlands are blank.

THE MACDONNELL RANGES

The old peneplane surface is surmounted by two other residual areas that are specially noteworthy. Near the Tropic of Cancer and almost in the middle of the continent from east to west are the Macdonnell Ranges (Fig. 3), which consist of a series of parallel ridges running east and west and rising to a maximum height of 4,786 feet in Mt. Heughlin. The ranges are crossed by the Finke River in an extraordinary series of gorges, which will have a distinct influence on future settlement. Many of the gorges are only a few yards wide and contain permanent pools of splendid water. They are ideal sites for reservoirs.

THE DESERT REGION

North and west of the Macdonnell Ranges the peneplane surface is desert in character. In the Tanami region the drainage is collected in shallow, salty depressions, and the pastoral area is limited to 500 square miles of well-grassed country. The sandy plain is dotted with mulga

(*Acacia aneura*) scrub and clay pans, and for several hundred miles at a stretch there is no permanent water except for a very small number of pools in rock holes. Toward the west the sand ridge or desert region has its greatest extent. This is the most inhospitable region on the continent, though most of its terrors have been minimized since a stock route was surveyed across it from Hall's Creek to Wiluna. In a day's march of some twenty miles Carnegie crossed from 60 to 100 sand ridges; in all, he traversed 420 miles of sand ridge country, the ridges being from 30 to 50 feet high and running approximately east and west. He described most of the country as a great undulating desert of gravel. Part of the region is underlain with artesian waters, but, at the present time, their use is a mere possibility. Mineralized localities have drawn the isolated settler.

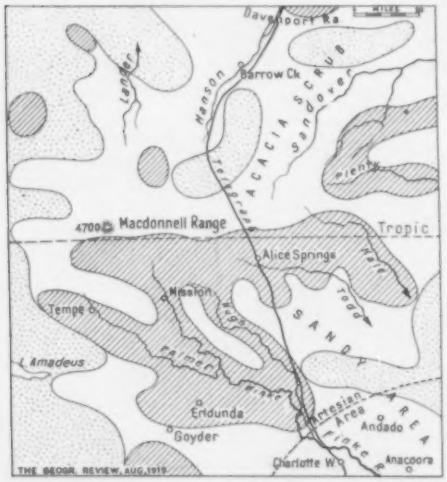

FIG. 3—Generalized pastoral map of central Australia in the region of the Macdonnell Range (based on Day's descriptions for the winter in 1916, which was distinctly wet). Ruled areas mostly well-grassed valleys with Mitchell grass and edible shrubs. Blank areas are rough or sandy country interspersed with fair grass flats and saltbush, etc. Dotted areas are chiefly spinifex and sandy country, feed scarce or absent; mulga (*Acacia aneura*) is almost universal. Permanent water is rare.

THE CENTRAL UPLANDS

East of the peneplane that forms the desert interior of tropical Australia is a region of uplands, once in much the same state of topographic development as the peneplane region on the west but now so well eroded by the headwaters of the Victoria and other streams that the original level is only indicated by scattered flat-topped hills. With a heavier rainfall the region supports many more cattle, and in the Victoria River uplands there are almost a dozen stations where over a thousand head are pastured. The land is fairly well watered and timbered.

The central uplands extend northward close to the sea, west of the Gulf of Carpentaria; and, although the soil is poor, there is a good deal of excellent grass in the bordering valleys and a certain amount of stock. The settlements are scattered along the telegraph line in the southern portion of the uplands, about 100 whites and 500 Chinese being engaged in mining, chiefly in the vicinity of Pine Creek. Wells are few and far between. The sparse population is indicated by the fact that even along the telegraph line for 300 miles, from Katherine to Newcastle Waters, there are only three men (at the telegraph office at Daly Waters). East-

ward from the central uplands the rainfall increases, and in the Barkly Tableland region (Fig. 2) there is a great deal of grass, upon which graze about 150,000 cattle and 50,000 sheep. Permanent water being very scarce in a bad season, a number of the stations are temporarily abandoned. Half a dozen people are sufficient to control the grazing of a large area.

Atherton Plateau

The central portion of the peninsula that runs along the eastern side of the Gulf of Carpentaria is a dissected peneplane of considerable elevation, whose eastern edge has been sharply truncated to form a part of the eastern coast of Australia and whose western flank is a gradual slope. The backbone of the peneplane is a range, rising to 2,000 feet, with a few cattle stations and telegraph stations upon it and also a few mines. The heart of the region is the most promising tropical portion of Australia and is called the Atherton Plateau. Here lies a triangular area, about 12,000 square miles in extent, all of it over 2,000 feet high. It is a mineralized region, favored by good climate and soil, adequate rainfall, and accessibility to railways. It supports large numbers of cattle, including many dairy herds.

The Climatic Factor

The Tropical Region

Except for a portion of the Sahara the Australian tropics are hotter than any other region of the world. The northwest, especially, has an unenviable pre-eminence. The only parallel is the Madras coast in India, and this is slightly cooler.

As the Australian region is approached the heat equator swings south across the "line" to pass through Wyndham and Port Darwin and thence runs northeast to the Gilbert Islands in the Pacific.

A reference to Figure 4 shows that four regions in the world (of which records are available) have average annual temperatures exceeding 82° F. These are shown in Table I.

TABLE I—The Four Hottest Regions in the World

Place	Region	Average temperature	Average rainfall
Massowah	Red Sea	86° F.	10 inches
Timbuktu	W. Sahara	84° F.	Under 10 inches
Wyndham	N. W. Australia	84.6° F.	27 inches
Tinnevelly	S. E. India	84.3° F.	50 inches

The two African localities are so dry that discomfort is greatly decreased, even with the fierce heat. The Indian and Australian localities both experience heavy summer rains and are, consequently, very muggy during the wet season.

It will be granted that northern Australia does not benefit in climate from its position in the Southern Hemisphere. The accompanying graph (Fig. 5) illustrates its position with respect to the rest of the world.

We see that Australia, north of latitude 20° S., is hotter than the area to the north, *is hotter than the average Northern Hemisphere* and hotter than the average Southern Hemisphere for the same latitudes.

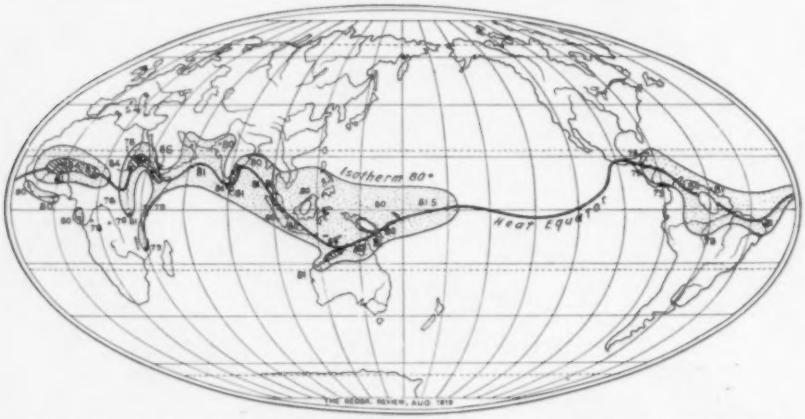

FIG. 4—The four hottest regions in the world—Timbuktu, Massowah, Tinnevelli, and Wyndham. Annual isotherm 80° F. and heat equator also shown. Regions with temperature over 82° F. are ruled. (Data from Hann's "Meteorologie.")

TEMPERATURE

The mean annual temperatures for northern Australia are given in Figure 6. The isotherm for 80° F. exhibits some peculiarities that deserve notice. The oblique direction of the hot belt is undoubtedly due to the prevalent southeast trade winds. On the eastern coast these winds tend to cool the land, as they come from the cooler ocean; but on the western side of the continent they are hot winds from the interior during a large part of the year and so raise the average temperature in the west. Hence, from the point of view of temperature, settlement is favored in the east and hindered in the west.

In the cooler months (May, June, July, and August) no portion of tropical Australia (except the Derby-Port Darwin coast) has a mean monthly temperature exceeding 80° F. It is unnecessary to emphasize the fact that in the greater part of the tropics—everywhere except the coastal fringe—the winter months have a delightful climate. But this statement applies only to the heat conditions, as the low winter rainfall militates against economic development.

In the hotter months (November-March) the whole of the tropics (except the coast south of Cairns) has an average monthly temperature exceeding 80° F. This is an undoubted disability, especially since these months also

constitute the wet season. The effect of this high temperature on the health and comfort of the population can better be considered after the rainfall and humidity data have been noted.

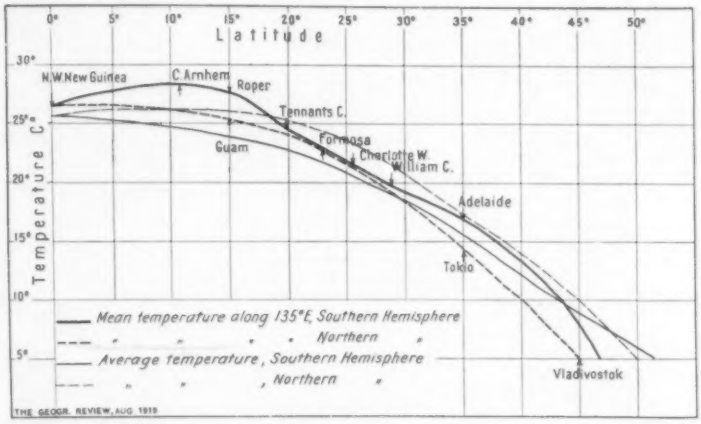

FIG. 5—Mean temperatures along longitude 135° E. (through Australia, etc.) in the Southern Hemisphere (thick line) as compared with those in the Northern Hemisphere (heavy broken line); also with average temperatures for the two hemispheres (thin continuous and broken lines). (Data partly from Hann.)

"Comfort," as a factor of settlement, appears to have been largely ignored up to the present. A high degree of health may be maintained, with constant care and moderation, under circumstances which cannot be

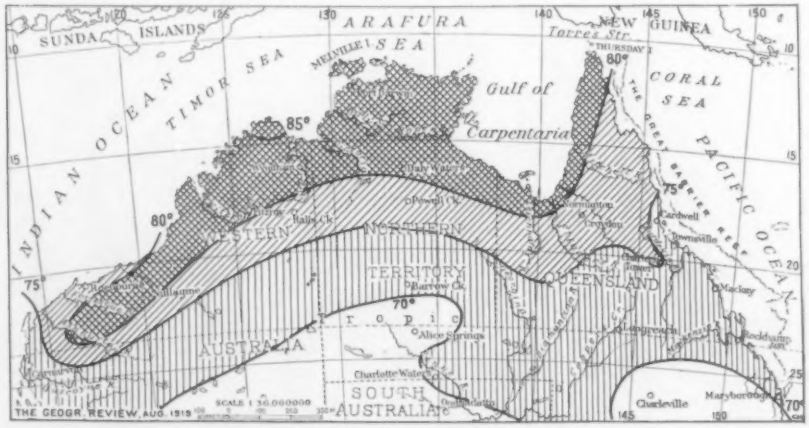

FIG. 6—Average annual temperature in tropical Australia (after H. A. Hunt).

termed comfortable. In a huge area like Australia, with much of the temperate zone only sparsely settled, it is obvious that prospective settlers will quite reasonably require something beyond conditions of bare health.

No problem in Australia deserves greater consideration than that dealing with the conditions of comfortable life in the tropics.

Temperature and Elevation

As we have now considered the distribution of highlands and isotherms in tropical Australia, we may briefly discuss how much this region is benefited in climate as the result of elevation. One writer asserts that "there exist north of the tropics considerable areas of sufficient elevation to counteract, to a large extent, the climatic conditions usually found in such latitudes."

On an average, the temperature is reduced 1° F. by an ascent of 300 feet. It will be admitted that an amelioration of 7° F. is necessary to "counteract the climatic condition." This involves an elevation of about 2,000 feet—and all above this level we may provisionally class with tropical plateaus.

These regions in Australia (see Fig. 1) are, in their total area, unfortunately, very small—as shown in Table II.

TABLE II—Regions Above 2,000 Feet in Tropical Australia

Locality	State	Approximate area over 2,000 feet
Atherton Plateau	Queensland	12,000 sq. mi.
Clarke Range Area	"	2,000 "
Northern Macdonnells	Northern Territory	14,000 "
Kimberley Region	West Australia	8,000 "
Pilbarra South	" "	10,000 "
Total		46,000 sq. mi.

This area of 46,000 square miles is only 4 per cent of the total area of tropical Australia and is in fact practically negligible.

How much more fortunate are other tropical regions is shown at a glance by Figure 7. Here the corresponding portion in southern Africa is charted. For instance, in Rhodesia, there are some 400,000 square miles of tropical country, all above 2,000 feet elevation, and with a climate of a correspondingly more comfortable character.

Rainfall in the Tropics

While there is little doubt that rainfall is the element that exercises the chief control on Australian industries—and, therefore, on settlement—yet it is very important that wrong conclusions should not be drawn from rainfall maps.

In Figure 8 the average annual rainfall for the tropics is charted—the region of heavy rainfall being shown by the black and cross-hatched areas. These extend along the northern and eastern coasts, all of which receive over 40 inches per annum. The region of good rainfall (20-40 inches) has a similar arrangement. The tropic almost coincides with the 10-inch

isohyet in the western and central areas, and no portion of tropical Australia receives less than 10 inches in normal years.

From a casual glance at the map there would appear to be little to choose between the northern and eastern portion of the tropics as regards this element. No greater error could be made. Whether from the point of

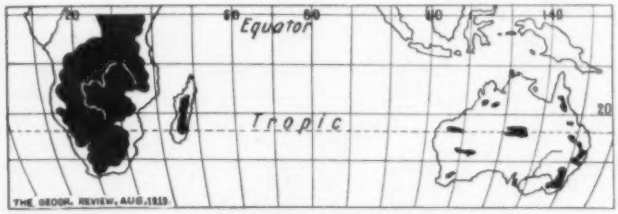

FIG. 7—Regions above 2,000 feet in southern Africa and in Australia. The difference in climate between northern Australia and Rhodesia (area shown by white line), as the result of elevation, is very marked, though they are in the same latitude.

view of grazing, agriculture, or of health and comfort, there is a strong distinction to be made between the rains of these two regions.

Both belong to the summer rain belt; but, whereas the northern precipitation is confined wholly to the summer months (and in fact for the greater part of this area to the four hotter months), the eastern rain is much more uniform. In addition to the period December-March there is also con-

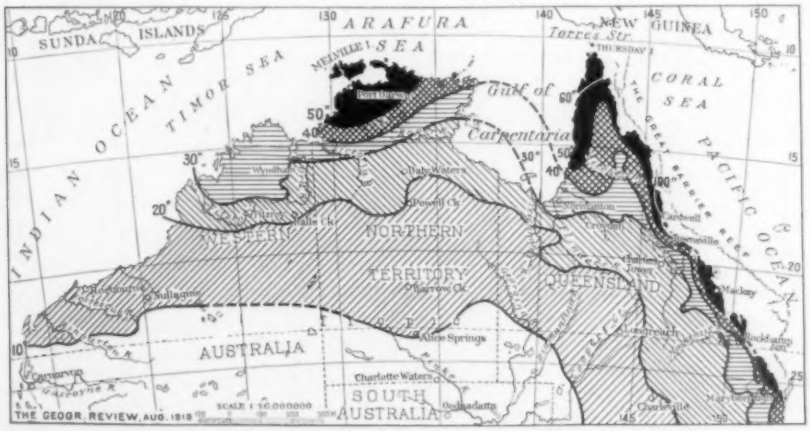

FIG. 8—Average annual rainfall (in inches) in Australia (after H. A. Hunt).

siderable rainfall in November, April, May, and June. This is due to the prevalent southeasters and to the frequent occurrence of tropical lows passing down the Queensland coast.

Only along the actual coast line in the north and east does the rainfall compensate for the evaporation. In the interior the rainfall is just about one-tenth of the evaporation, and there is no need to dwell on the effect of

this enormous withdrawal of moisture upon the resources of the tropics. The well-watered region of the Australian tropics is confined to eastern Queensland. The rest of the tropics has six, seven, or eight months of drought every year (Fig. 9); but this evil feature is compensated to some extent by the presence of an indigenous flora which flourishes through long adjustment to environment.

There is one other aspect of rainfall that is of considerable interest. It is well known that in some regions of Australia the rainfall is much more reliable than in others—quite irrespective of the amounts. Thus the 20 inches that the wheat farmer can expect to receive with some certainty

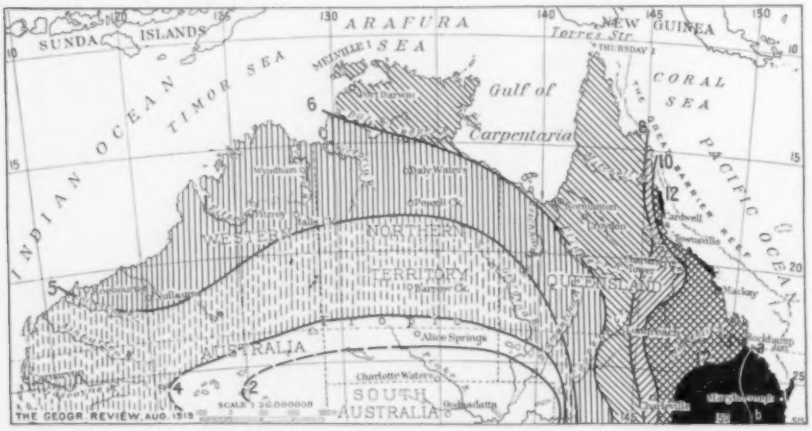

FIG. 9—Rainfall uniformity map. The figures represent months receiving more than one inch of rainfall.

in the Katanning district of West Australia is much more valuable than the 20 inches which may fall in Wiluna in the course of a few days.

The reliability map (Fig. 10) shows that Port Darwin and Thursday Island vary less than 20 per cent from their normal amount and that the variation increases inland. Kimberley comes out rather well, but the Pilbarra region is highly erratic; and the rainfall of the Barkly Tableland is also unreliable. The Macdonnell and Frew River regions are slightly better than the surrounding districts. This map is of considerable importance in connection with all suggestions of crop growing in the Australian tropics. It has been asserted that the Barkly region, and even the Macdonnells, will grow wheat without irrigation; but, even if the rainfall were suitable in average amount and in season, this map shows that it is too erratic to justify agriculture in those regions.

HUMIDITY

Humidity, quite as much as temperature, controls the health and comfort of settlers in the tropics. Speaking generally, regions of high humidity are unfavorable for white settlement.

In July (Fig. 11) the only region with high humidity is the Cape York Peninsula, while the Port Darwin region and the Townsville coast have moderately high humidities. In January (Fig. 12) conditions are, of course, much worse. All the coastal regions and a considerable belt inland exceed an average of 60 per cent. Only in the Pilbarra region is there a hinterland with a moderate humidity in summer.

It will be seen that the elements rainfall and temperature operate in different directions as regards products and as regards comfort respectively. High rainfall and high temperature mean, usually, a more fertile land with greater resources, and in this respect the eastern tropics have the advan-

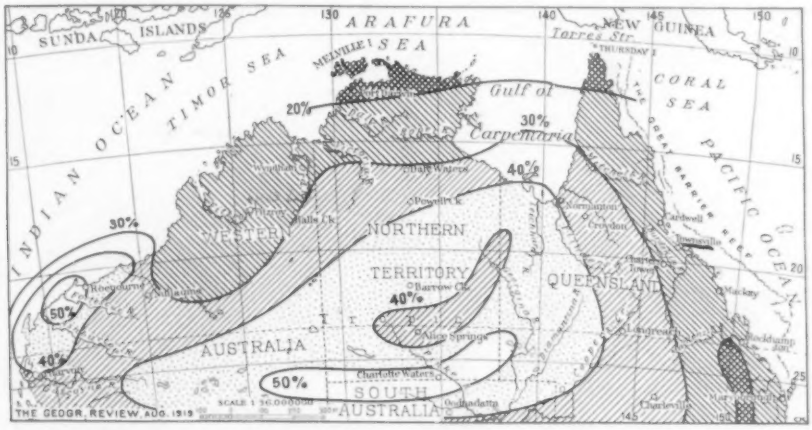

FIG. 10—Rain reliability map. The figures represent the percentage variations (from the normal annual rainfall) which may reasonably be expected. (Based on data 1891-1910). The cross-hatched areas are most reliable, and the white and dotted areas the least reliable.

tage. But low rainfall and low temperature mean low humidities, and in this respect the western tropics are, on the whole, more comfortable—at any rate during the summer months.

Natural Vegetation

The most direct evidence of a country's possibilities for settlement is furnished by the natural vegetation. It acts as an index of the soils, the rainfall, and the temperature. On these conditions are founded the great primary industries of agriculture and grazing. If only two maps were available for an economic forecast, then the geographer, for the above reasons, would prefer the vegetation map and the geological map, which, in a similar fashion, furnishes the key to the topographic and mineral aspects of the problem.

No error is more common on the part of geographers than their indication of the northern quarter of Australia as covered with a tropical forest. They have been misled by the heavy annual rainfall and do not realize

that—as has been previously pointed out—there are in the northern tropics six months of drought in each year. This does not prevent the growth of fairly large trees, but it does account for the absence of true tropical

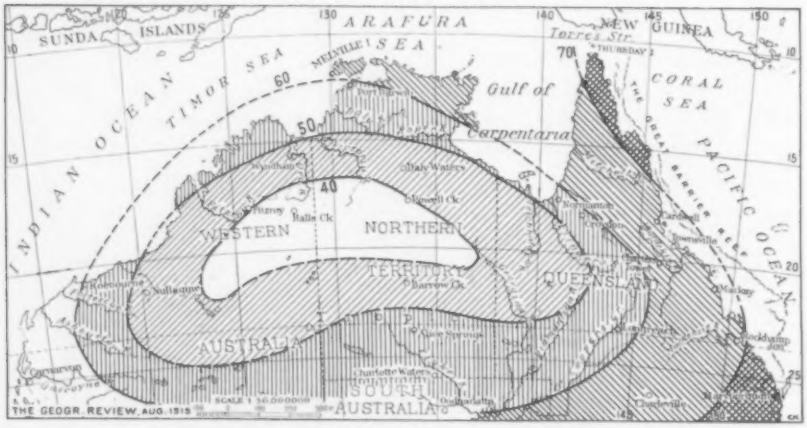

FIG. 11—Average relative humidity for July. Note that Thursday Island is much worse than Broome.

forest filled with lianas and undergrowth, which latter are practically confined to the eastern coast of Queensland.

The broader features of the native vegetation are shown on Figure 13.

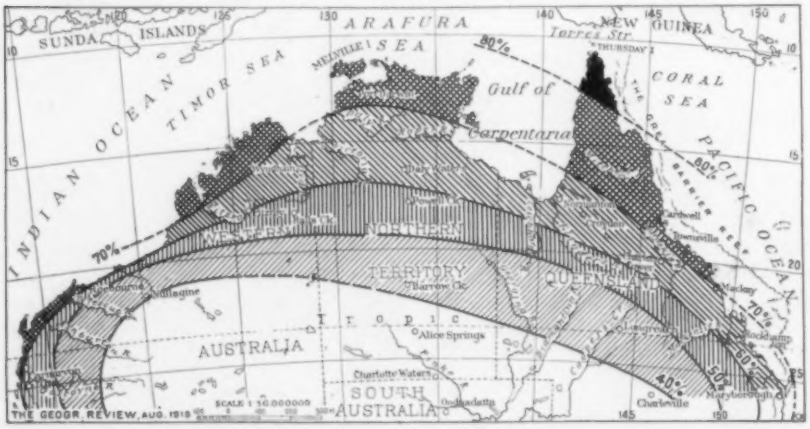

FIG. 12—Average relative humidity for January. (The western coast between Roebourne and Carnarvon should be ruled to indicate 60%-70%.)

THE SAND RIDGE COUNTRY

The desert portion of tropical Australia, or the so-called Sand Ridge region, contains thickets of spinifex and clumps of mulga, with other trees growing sparsely in the hollows. The chief economic plant is the fleshy

parakeelia (*Portulaca*). Toward the northern edge of the desert the vegetation becomes more abundant, with fine specimens of the ubiquitous gum (*Eucalyptus rostrata*) in the creek beds where ground water is available. Saltbush and coarse grass are not rare on the protected western and northern sides of the ridges. It is a striking fact that a supply of drinking water may be found only 20 to 30 feet below the surface.

On the Macdonnell Ranges the principal peaks, which rise 2,000 feet above the plains, are bare of foliage; but gums and spinifex grow on the lower slopes while the plains are covered with saltbush and native grasses, alternating with belts of mulga.

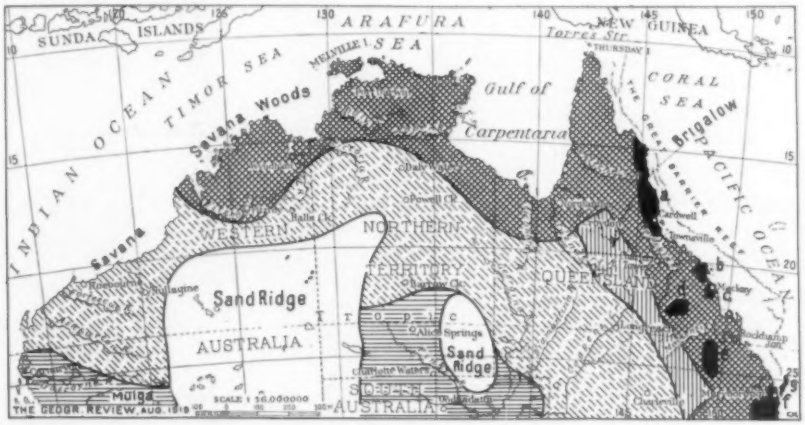

FIG. 13—Main features of the vegetation of tropical Australia. Timber forests are black; *a*, *b*, *c*, and part of *f* are tropical rain forests; *d*, *e*, *f*, and *g* are valuable eucalypt forests. Note that the provinces merge into each other. (Based in part on Diels and Jolly.)

THE SAVANAS

One of the most extensive belts of vegetation is the savana, or prairie type, which extends from North West Cape, on the extreme western edge of tropical Australia, eastward through the greater part of the hinterland north of the Tropic of Capricorn, reaching into the sand and mulga country of the dry interior and into the savana woods on the wetter coastal margin. At places it is marked by widespread areas of small trees belonging to the eucalyptus and acacia types, but its general aspect is that of an open grassy plain with an abundance of bird life and native game. The savana type of vegetation reaches its perfection in the uplands of the Barkly and upper Victoria basin region and in central and western Queensland.

FOREST AND OTHER REGIONS

Where the edges of the tablelands invoke a heavier rainfall (25 or more inches a year), as about the borders of the Kimberley region, there is a

zone of woodland in which eucalyptus dominates, grass grows everywhere, and undergrowth is practically absent. It is a "park-land" type of country. Eucalyptus is not the exclusive tree; there are pines, the baobab, the kapok, and other characteristic woods of the tropics; but the trees are isolated and there are no true forests. Hardly any jungle exists, only a patch here and there. The size and position of true tropical jungle areas of any considerable extent are indicated on the map (Fig. 13).

Along the eastern coast of Queensland the rainfall is much more regular and the forests more luxuriant, although the greater portion is still of the

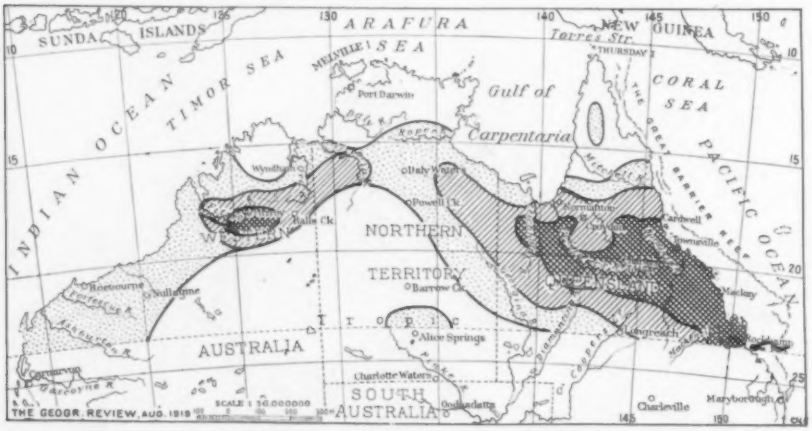

FIG. 14—Distribution of cattle (about 1912). Very numerous, cross-hatched; medium, ruled; sparse, dotted.

open "park-land" type with a close undergrowth of grasses. The wood consists of eucalyptus, such as ironbark, bloodwood, stringybark, etc. Hardwood forests of special economic value for timber are confined almost wholly to the temperate portions of Australia. In tropical Australia they have been exploited only in eastern Queensland.

All about the Gulf of Carpentaria the country is low and, on the whole, poor from a pastoral standpoint. The vegetation is coarse grass and stunted gums. With the exception of Borraloola and a few mission stations there is hardly a settlement along the western and eastern sides of the gulf.

Economic Resources

Pastoral Resources

The chief asset of tropical Australia is grass. Sufficient development has taken place to enable the geographer to classify the best areas for grazing, and to determine the regions where future increase is most probable.

In Figure 14 is shown the distribution of cattle about in 1912, and there has not been much alteration since. Rockhampton has the densest distri-

bution, but all along the Northern Railway in Queensland there are about 20 cattle to the square mile over large areas. On the Fitzroy River, in West Australia, a similar density obtains. In other regions of the tropical division the density is much less; and there are practically no cattle in the wettest regions (over 50 inches a year) and in the driest regions (less than 10 inches).

Hence the best cattle country is determined primarily by the rainfall and lies between the 15- and 40-inch isohyets—the 20-inch being perhaps the best. Assuming that the newer northern and western regions will

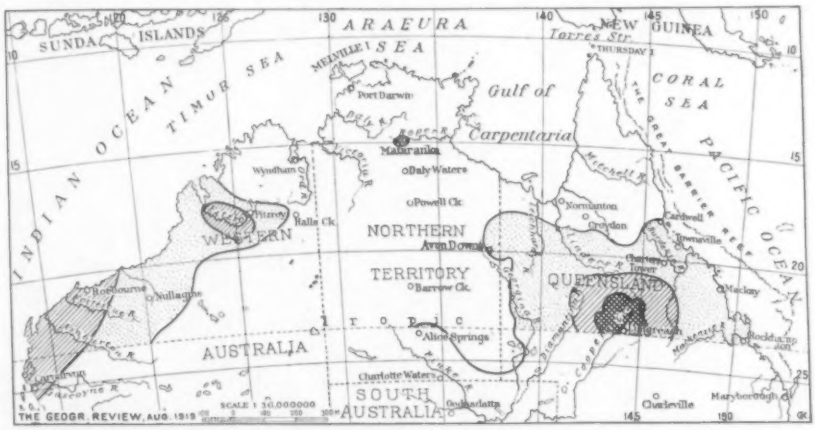

FIG. 15—Distribution of sheep (about 1912). Very numerous, cross-hatched; medium, ruled; sparse, dotted.

progress along similar lines, then a glance at the rainfall map (Fig. 8) shows that the chief advance will be made in Kimberley (W. A.) and the Northern Territory.

There is, of course, some rivalry between cattle and sheep. The latter pay better on country which is suitable for either—but in the wetter and warmer coastal regions the hardier cattle do better than sheep. Moreover, they can travel farther for water and live on rougher feed—so that the newer territories will probably be developed first as cattle stations.

Dairies will continue to multiply in such regions as the Atherton Plateau, where there were 450 in 1913, and along the central Queensland coast. But the long dry winter is likely to prevent extensive dairying in any other portion of the tropics. Some experiments in dairying are, however, being tried at Port Darwin.

It is worthy of note that the Indian buffaloes do well in the wettest and hottest regions of Australia, where ticks, disease, and coarse grass have given great trouble to European cattle.

In Figure 15 is the corresponding map showing the distribution of sheep in tropical Australia. They are densely congregated near Longreach, in Queensland, but do not bulk largely at present anywhere else. The Barkly

Tableland, however, grazes over 50,000 at Avon Downs, and there are about 10,000 in the Macdonnell Ranges, while an experimental flock of 2,000 is progressing satisfactorily at Mataranka, far to the north. With increased facilities the sheep belt may be expected to spread across through the Territory along the 20-inch isohyet, to meet the valuable sheep tracts on the lower Fitzroy in West Australia. It seems doubtful if the rougher, wilder country of the tropics will be used for sheep until present conditions have almost disappeared; the chief immediate extension of the sheep country will probably occur rather in temperate regions.

FIG. 16 — The sugar region in Queensland, shown by black areas (figures are thousand acres). Controlling isotherms in January and July are given and also the 30-inch isohyet (read thus for "30° Isohyet").

THE SUGAR INDUSTRY

In northern Queensland, between the tropic and latitude 15° S., there is a thriving industry of special interest, because it appears to be the only important example of tropical agriculture carried out by British labor. Over 27,000 white people are engaged in this industry along the northeastern coast of Australia from Grafton (N. S. W.) to Cairns (Queensland).

In Figure 16 the climatic controls governing the crops are indicated. The rainfall control is the most important and confines the plantations to the coast, where the rainfall (or equivalent irrigation) exceeds 40 inches a year. The southern limit is determined by the temperature in the coldest month. Grafton is, of course, far south of the tropic. The northern boundary is probably fixed in Queensland by the fact that in the Cape York Peninsula the total rainfall—though abundant enough—is not uniform, and for the six winter months in the year very little rain falls north of Cooktown.

The map also shows that nearly twice as much sugar is produced in the northern tropical coasts as in those south of the tropic. Mackay is the chief center. Here there were 39,050 acres devoted to sugar in 1915, and the yield was about 30,000 tons. The total for the tropical coasts was 103,000 tons.[2]

[2] Queensland Statistics, 1915.

Possibilities of Agricultural Production

Next in order comes the consideration of the suitability of the Australian tropics, *per se*, for such important products as wheat, rice, cotton, tea, and coffee.

As in the study of human comfort, discussed elsewhere,[3] it is helpful to use the graphic method. The two chief controls which determine the suitability of a region for plant life are temperature and rainfall. Soils are of great importance, but in this huge tropical tract there are hundreds of acres of fertile river flats that have never been developed in the slightest—so that the soil can be assumed to be satisfactory. The seasonal variations in heat and moisture are also of great importance, and the method to be described seems to illustrate this very satisfactorily.

To the graph representing these controls the name hythergraph has been given, based on the Greek words for rain and heat. The graphs are drawn just as were the "climographs" in the paper cited but on co-ordinates of rainfall and temperature.

In Figure 17 the hythergraphs for typical localities in the Australian tropics are given. The graph for Port Darwin lies almost wholly on the 83° temperature abscissa. This is what one would expect from its position near the equator. The rainfall range is very great—from 15 inches in January (extreme right) to negligible amounts in midwinter. As we move southward the hythergraph changes to the opposite type, which is illustrated by Alice Springs. Here the rainfall varies but slightly—from 50 points to 150 points a month; but the temperature range is great—from 83° F. in January (*J*) to 51° F. in July (*JL*).

Intermediate localities partake somewhat of both types. Thus Rockhampton has a hot season resembling Port Darwin, with constant temperatures (about 77° F.) and very variable rainfall; and a cooler season, with more constant rainfall (1 to 2 inches) and very variable temperature (from 60° F. to 75° F.). Longreach typifies the inland towns and approximates to the Alice Springs type.

The unusually satisfactory conditions on the Atherton Plateau in northern Queensland are illustrated by the hythergraph for Herberton. This belongs to the summer-rain type; but, owing to its elevation of nearly 3,000 feet, it is almost 10° cooler than Rockhampton, far to the south. It is a thousand pities that there are not more of these tropical plateaus in Australia. Many valuable crops would grow excellently there.

Wheat

Let us see how the hythergraph method helps us with regard to wheat possibilities. In Figure 18 many typical wheat localities are plotted, and

[3] *Commonwealth Bureau of Meteorol. Bull. 14*, Melbourne, 1916. See *Geogr. Rev.*, Vol. 4, 1917, pp. 401-403, and Vol. 5, 1918, p. 86.

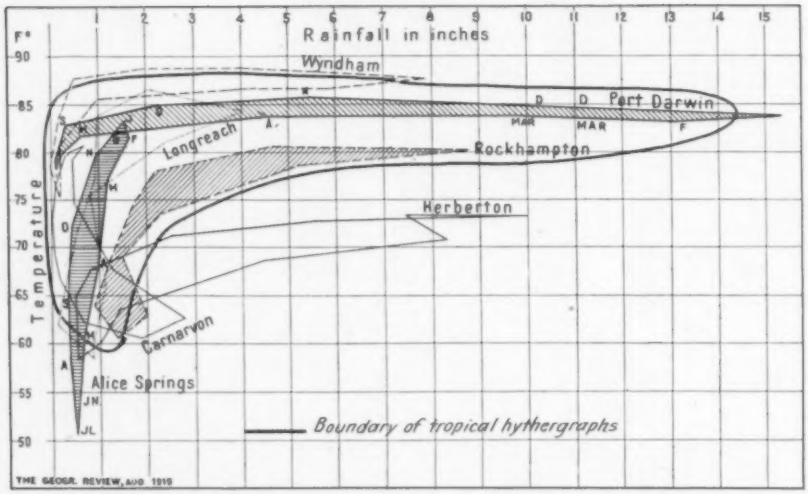

FIG. 17—Typical hythergraphs for tropical Australia. The initial letters refer to the months. Horizontal distances represent rainfall per month; vertical distances, temperature. Wyndham represents the hot northwestern coast, Carnarvon the dry southwestern coast, Port Darwin the hot wet northern coast, and Rockhampton the hot wet southeastern coast. Alice Springs is in the arid interior. Longreach is good inland sheep country. Herberton is a cool plateau. The heavy boundary includes all the typical localities.

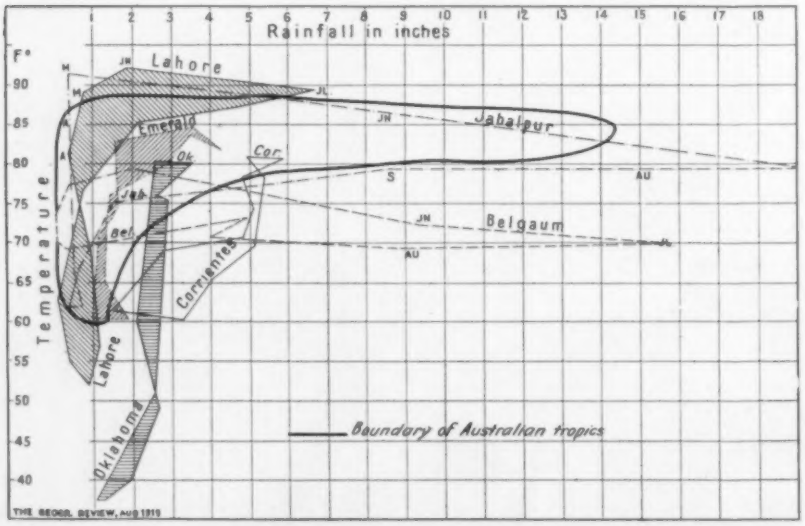

FIG. 18—Hythergraphs for wheat. The wheat of temperate regions closely resembles the Oklahoma graph. Hot-climate wheat grows at Lahore, Jabalpur, and Belgaum (India) and at Corrientes (Argentina). Emerald (Queensland) is inserted for comparison. The heavy black line is taken from Figure 17.

their position with respect to the aforesaid "Australian boundary" can be seen at a glance.

The chief wheat lands of the world are in the United States, south-eastern Europe, and India. If we plot type localities we find that there is a big range of possible controls (especially in rainfall) in some of the less important regions. But Minneapolis, Oklahoma, Bucharest, and Albury (N. S. W.), to choose four well-known regions, are all of the type shown by the Oklahoma hythergraph. There is great range of temperature but not so much range in rainfall. The wheat is often planted in the autumn and lies dormant during winter, to start vigorously in spring and be harvested about midsummer.

But there is another type of wheat harvest, and this is the one which concerns our tropical lands. In India the wheat is sown at the end of the hot weather, when the heavy rains are over, and depends chiefly on the moisture in the soil rather than on the rainfall during growth (though this also helps, of course). Under these conditions wheat is grown as far south as southern Bombay (near Belgaum, 16° S. and 2,000 feet elevation) and, more largely, near Jabalpur on the tropic. The typical area is, of course, in the Indo-Gangetic plain, and Lahore will serve as an example. The wheat is reaped at the close of the cold weather, in April or May.

The northern limit of extensive wheat culture in Australia lies at present in latitude 26° S., or well south of the tropics. But there is no climatic reason why special wheats should not grow very much farther north in the Queensland hinterland.

The chief Indian wheat areas have an average temperature of 75° to 79° F., while in the growing period the temperatures range from 64° to 71°. These latter temperatures are precisely those of eastern Queensland. Thus in inland Queensland, south of Bowen, the region from Mackay to Charleville has the same dry winter and spring with only 5 to 10 inches of rain.

Emerald (on the tropic) receives 14 inches of rain in the wet season. The wheat might be grown on the Indian method, that is it might be sown early in March. It would ripen in about four months, before possibility of frost or severe cold, and would receive therein an additional five inches of rainfall. The hythergraph for Emerald is shown on Figure 18, where it is seen to lie midway between Lahore and Oklahoma.

A similar warm wheat region is illustrated by the graph for Corrientes (northern Argentina). Here, however, the average rainfall is considerably greater.

It will be seen that the Herberton district is closely paralleled by Belgaum in the higher portion of southern Bombay; while Jabalpur is, to some extent, a homoclime of Port Darwin and shows that it is possible to grow some wheat even in such a tropical region as this. But it must be remembered that in India these conditions of rain and heat are general over

large plains and extensive plateaus of rich river-alluvial or decomposed volcanic débris. In tropical Australia such extensive areas are non-existent; and, speaking generally, the northern wet regions seem, unfortunately, to be either rather poor in plant food or, if fertile, very restricted in extent.

While recognizing that these theoretical considerations are of much less value than practical tests, which various authorities are beginning to carry out, the above discussion may be novel and valuable as regards potentialities and comparisons with the homoclimes elsewhere. At any rate these

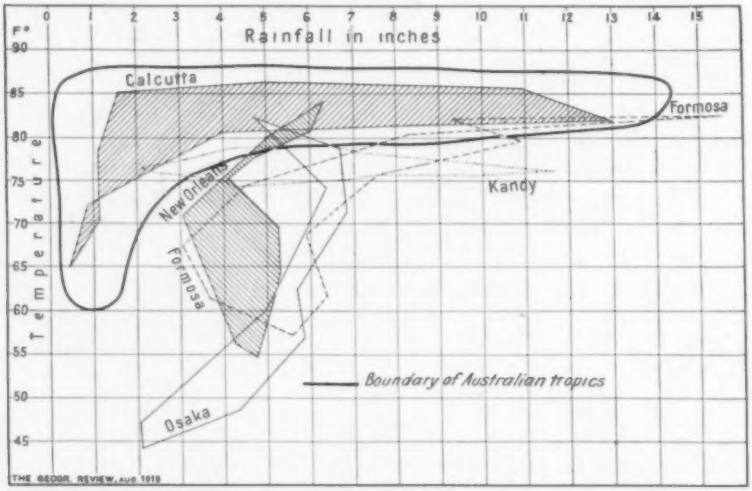

FIG. 19—Hythergraphs for rice (Calcutta and New Orleans) and tea (Kandy as in Ceylon, Formosa in China, and Osaka in Japan). The heavy black line is taken from Figure 17.

graphs deal with average conditions, which cannot be tested in the field until many years have elapsed.

RICE AND TEA

Hythergraphs are shown for rice and tea in Figure 19, with the addition of the Australian boundary line to act as a criterion. Rice is grown (usually, of course, with irrigation) in great quantity near Calcutta, whose graph is seen to resemble closely that for Port Darwin or Cairns, near which suitable river flats occur. There is, however, in Australia no tropical region with a climate resembling that of New Orleans, where also large crops of rice are grown. When we remember that rice is grown satisfactorily in northern Italy, we realize that this plant has a tremendous range of habitat and will, undoubtedly, flourish anywhere in the Australian tropics where rainfall and soils are suitable.

As regards tea, it is suited by cooler and wetter conditions for the most part. The homoclimes of Kandy and Formosa suggest the Atherton

Plateau as the only promising field; but the great temperature range successfully resisted by Japanese teas (see Osaka graph) seems to indicate a field for tea in southeastern Queensland, just south of the tropics.

Coffee and Cotton

Coffee is illustrated in Figure 20. The graph for Juiz is very close to that of Herberton—as we should expect, for coffee has been grown in the latter district. Juiz lies 100 miles north of Rio de Janeiro, in Brazil, in the

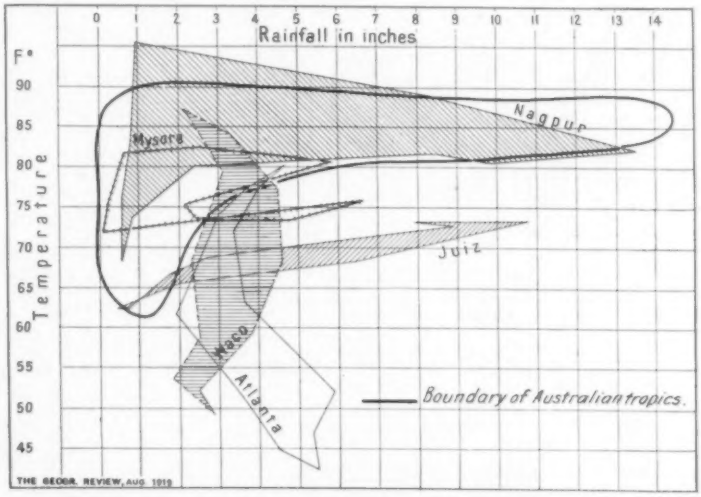

Fig. 20—Hythergraphs for coffee and cotton. Atlanta and Waco are great cotton centers in the United States. Nagpur shows a tropical cotton area in India. Juiz (Brazil) is the center of the chief coffee area. Mysore shows a hill coffee area in southern India.

center of the chief coffee district in the world. The hythergraph for another coffee region—Mysore, in southern India—is also given. This is one of those elevated tropical regions in which Australia is deficient.

Cotton is a crop which grows under conditions somewhat similar to those for wheat. In the United States the great cotton belt experiences much cold weather, as is evident from the hythergraphs for Waco (Texas) and Atlanta (Georgia). But there are also large crops of tropical cotton—such as those of central India. The graph for Nagpur (21° N.) is sufficiently like those of the wetter tropical coast lands of Australia to be very encouraging.

Crops in Northern Territory Coast Lands

The graphs discussed above will serve to show how the climate compares with those of other analogous regions of agricultural importance. But mention must be made of the lengthy experiments on tropical agriculture carried on near Port Darwin.

At Bachelor the following crops were grown on a fairly substantial scale during 1914 and 1915: cowpeas for fodder and manure, 50 acres of rice, 25 acres of maize, 14 acres of lucerne (which was choked by the rank grass), 12 acres of Hungarian millet, and 3 acres of wheat. The early onset of the dry season seriously affected most of these crops, especially the wheat.

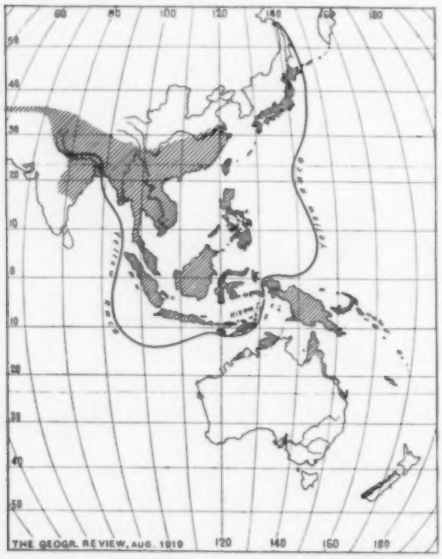

FIG. 21—The yellow race in the tropics. They have settled exclusively in regions receiving over 50 inches rainfall per annum (shaded area). Only the regions immediately around Port Darwin and Thursday Island and Cairns have a similar climate in Australia.

At Daly River corn and cowpeas were grown, and numerous pigs flourish on the native lilies in the *billabongs*. At the Botanic Gardens there were experimental plots of coffee, groundnuts, cassava, and various types of rice, which have given encouraging results.

Of these crops the Administrator writes: "Purely tropical products, as grown in other similar parts of the world, such as cigar tobacco, sisal hemp, cotton, tea, coffee, etc., are obviously out of the question here, where abundant cheap labor is unobtainable. Efforts, therefore, must be directed towards those crops (rice, etc.), which may be grown by aid of labor-saving machinery." He remarks that an agricultural laborer who has anything to do with farm machinery expects £4 per week. "I know of practically no soil (save very rich soils close to great centers of population) which, at any rent or no rent, will enable agriculture to be conducted in such circumstances."[4]

The Race Question

Some observations on the race question may be of interest, although they touch on political as well as geographical principles.

The White Race in the Tropics

The subject of the white colonization of the tropics has been treated fairly fully, considering how handicapped it is by lack of evidence. The only tropical regions of any extent colonized by white peoples are the

[4] Northern Territory Report, 1915.

Sudan, Abyssinia, and southern Arabia—and the white peoples concerned all belong to the Semitic and Hamitic branches of the Indo-Aryans. The Syrians, who are occasionally met with in Australia, are members of this important group.

Elsewhere the Aryan race is comparatively unimportant. The Indians of Bombay and the Portuguese and Spanish of tropical South America practically exhaust the list. Australia—especially northern Queensland—is the only important tropical area settled by northern Europeans, so that the evidence furnished in this region is of especial value. It is, however, to be noted that there is little settlement in Queensland within 16° of the equator.

If we glance at a map of the tropics as settled by the yellow races (Fig. 21), we are struck by the fact that all such tropical lands have an abundant rainfall, in which they differ greatly from Australian tropical areas. Only the merest fringe around Port Darwin and Cairns recalls the lands of Java, Borneo, Siam, and southern China. The yellow race is nowhere indigenous in regions with a hot, dry climate, such as the Australian hinterland or Rajputana.

The White Australia policy—for good or evil—effectually blocks all settlement by Mongols, Indians, or half-castes. In connection with the last type, some mention should be made of the Dutch half-castes of Kissa Island. This island lies off Timor (Fig. 21) and is only 400 miles northwest of Port Darwin. In 1665 (according to Professor Macmillan Brown, of New Zealand) eight Dutch soldiers were abandoned here. Their progeny, numbering 300, still inhabit Kissa and often have light hair and blue eyes, though the skin becomes as dark as that of an Italian as these fairer individuals grow up. Professor Brown's conclusions are of much interest to Australians. "The main cause of their vitality and vigor I take to be their dry and barren islet (which is only six miles long and yet supports 6,000 people) compelling them to work if they are to live. Droughts are bad and eliminate the unfit. In the tropics moist heat is on the side of luxury and idleness, and it reinforces our natural inertia and longing for ease. The dry heat of the Australian plateaus interferes little with that vitality and energy which makes life a healthy pleasure. As long as human life keeps to the plateaus in tropical Australia and is bred in moderately hard conditions, it will not cease to perpetuate itself in a vigorous posterity. That is the lesson of Kissa."[5]

Two Possible Methods of White Settlement

Since settlement is to be confined to the white races, two courses seem open. Ravenstein has answered the question as follows: "If the white man is ever to occupy, permanently, the tropical parts of the world, it will have to be done by stages—each stage making a generation of men.

[5] Macmillan Brown in *Sydney Morning Herald*, 1912.

For instance, in Eurafrica, a steady stream is setting southwards. Germans and Belgians are pouring into France, Frenchmen are going to Algiers, Arabs to the Sudan, and the Sudanese are pushing forward into Bantu Africa."

It might be possible to accelerate this migration over some stages and to introduce into the tropical coast lands of Australia those Europeans who are most fitted by previous environment. These would undoubtedly be the Spanish, Italians, and Maltese. They would obviously be several generations ahead of any British immigrants in the required cycle of climatic evolution. Unfortunately they tend to leave their wives at home in Europe[6]; and, as Dr. Gilruth points out, though they are paid extremely high wages in the Territory, ostensibly to support their families there, the money largely goes out of the country. This method of settlement has not, therefore, helped Australia very largely up to the present.

And so we are left to the alternative. It is a perfectly natural method and one that would have a chance of success if the world were not already a welter of nations, jostling each other in their need for a place in the sun. As foreshadowed above, the method consists merely in a slow migration from cooler to warmer regions accompanied by generations of gradual acclimatization.

In his own experience the writer has passed through the stage necessary to accustom an Englishman from Sheffield (which has an annual temperature of 48° F.) to the climate of Sydney (with an annual temperature of 63° F.). This is merely a matter of a few years—though longer for middle-aged folk. A shorter period is necessary for the Englishman in Melbourne—none at all in Hobart. But in the uniformly hot climate of the tropics a very different period of acclimatization is needed.

The average white settler has not yet become accustomed to the worst months of the northern Queensland coast. It may become easier for his children, but it is undeniable that infant mortality is much greater in the tropics than in cooler regions. It is this latter fact that makes the experiment so protracted and costly. A strong, vigorous Englishman, with a respect for the rules of hygiene, can exist in some comfort in any region from the equator to the pole; but not until he can rear his children in the tropics, with no higher a death rate than in more favored regions, can he be said properly to have conquered the tropics. Needless to say, this happy state has not yet been approached; and we can only hope that time—that indispensable factor—will be granted to Australia to carry on the experiment. Probably the sugar plantations in northern Queensland offer the most striking attempts; and it speaks well for the future that it is possible to carry on farming operations with white labor, even with such artificial adjuncts as bonuses and unprecedented labor conditions.

[6] Dr. Thomson states that Italians with their families are settling permanently in the sugar areas north of Bowen, that is in latitude 20° S.

As the writer has said elsewhere, "It has been pointed out that white adults can live in almost any part of the tropics in a healthy condition—and this is certainly the case in the Territory—provided that certain necessary precautions in housing, diet, and hygiene are obeyed. It is precisely this necessity for special care and increased exercise of common sense which is found so irksome by the average newcomer to a tropical region. Especially is this the case in the wet period, when a large measure of energy is required to overcome a natural lassitude." The well-housed wife of a senior official with efficient colored servants is in a very different position from the poor immigrant woman; but it is the feelings of the latter that will largely control future close white agricultural settlement along the northern coasts.

A Slow and Difficult Process

How the struggling white farmer's wife is to rear her babes, handicapped by a tropical climate and probably assisted only by ignorant black *gins*, is a problem of which no solution is at present obvious. It is a vicious circle. The white immigrant will not go there because the disabilities—largely due to the sparse population—are so great; and the population is, obviously, so sparse because there are so few immigrants.

If, however, Australia is left alone until conditions of life become much more strenuous in the favored southern areas, then the increased economic pressure will produce the needed influx of immigrants already partly acclimatized to warm climate conditions. But a long lapse of time is indicated, especially as Australia is now notorious as an example of the growth of cities at the expense of the rural population.

A glance at the humidity charts (Figs. 11 and 12) will show that there is a great difference between conditions of life in the northern coast lands from Derby to Cairns and those in the east from Cairns to Rockhampton. Hence, although we know that sugar cane (for instance) is a feasible crop for white labor along the latter coasts, it would be rash to assume that agriculture is, therefore, certain to succeed under white labor along the other more tropical coasts.

Seeing, for example, that only twice in three months in 1917 (January-March) did the wet-bulb temperature fall below the value of 73° F. (which Lamb and others have accepted as the limit of comfort), the prospects of economic white farming along the northern coasts during all the summer months do not seem at all promising.

Future Prospects

We have now considered, in as great detail as space permits, the potentialities of tropical Australia. Speaking generally, it is a pastoral land, almost the whole of which can be used in normal seasons for the rearing

of stock. Only in the inland portion of West Australia is there an area (about 150,000 square miles) which seems to defy permanent occupation—even when the subartesian waters shall have been properly utilized.

Classification of Areas as Regards Future Settlement

So far as future settlement is concerned, we may classify tropical Australia in six divisions, of which four are pastoral and two agricultural. They are shown in Table III (see Fig. 22).

TABLE III—Land Classification of Tropical Australia

	Class	Approximate limits	Approximate area
A	Desert area	Between the tropic and Sturt's Creek	150,000 sq. mi.
B	Arid pastoral land	Carnarvon, Broome, and Boulia (excluding A)	300,000 "
C	Good pastoral land	Broome, Port Darwin, and Camooweal	280,000 "
D	First-class pastoral land	Camooweal to Barcaldine	170,000 "
E	Eastern farming area	East of 145° E. longitude	146,000 "
F	Northern coast lowlands	Victoria River to Cooktown	114,000 "

The greater part of class A can support no population at all.

Much of class B can only be lightly stocked and is liable to periods of prolonged drought, so that the human settlement depending on the pastoral industry in the southwest inland portion of the tropics does not offer much hope of becoming anything but negligible. It resembles the grazing country of Arizona, the southern Sahara, and Rajputana. In spite of much larger populations in the vicinity none of these arid regions have been able to support more than a sporadic settlement.

The White Australia policy prevents the profitable use of the denser populations of western Rajputana for comparison, and the same remark applies to the southern Sahara.

We may, however, look to a time when the more favorable areas of Australia begin to reach the density of similar regions in the United States. In such circumstances the arid lands of the tropics may reach the density of those in Arizona, which even now support less than one person to the square mile. As in Arizona, there are valuable mineral deposits in the arid tropics, but mining never leads to close settlement in the same way as farming. Thus in all the "non-agricultural" mining fields of Australia, it has been calculated, there are probably only about 120,000 inhabitants.

With regard to class C—good pastoral lands receiving from 15 to 30 inches of summer rainfall—there is no doubt that it will ultimately support a large population. It contains, however, much cereal and forest land, so that the figure is too high for the Australian region if it depends wholly on pastoral returns. Apparently no other dry, hot lowlands are occupied by a European (or half-caste) race. In Rajputana the density is about 50 to the square mile, mostly congregated in the wetter eastern portion. Jeypur, with 20 inches of rainfall, has 175,000 inhabitants. We may

safely assume a density of one white to the square mile when the wetter portions are growing millet, pulses, etc., as it is possible they will in the future.

The country in the east of the pastoral belt (D) rejoices in a more constant rainfall. Much the same regions will serve as homoclimes as for class C. We may reasonably expect two or three persons to the square mile.

As regards the agricultural and neighboring districts in eastern Queensland (E), their nearest homoclime (as described) is the eastern coast of India. This is largely peopled by Dravidians, whom some authorities classify as a black race. We shall do better to investigate the conditions

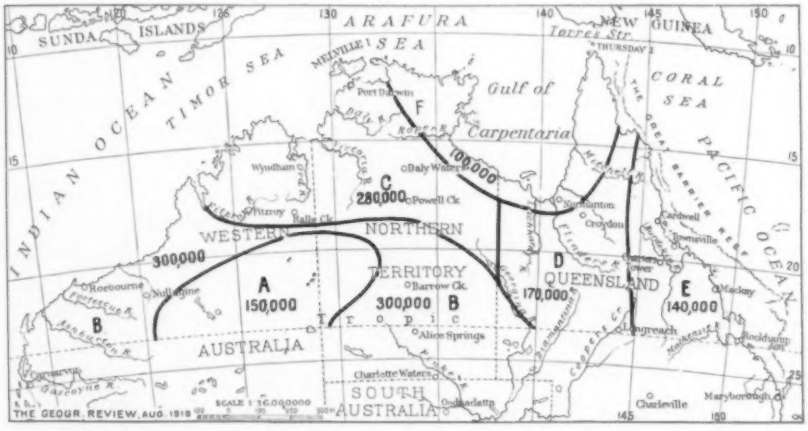

FIG. 22—Major economic provinces of tropical Australia. The boundaries are only approximate Figures represent square miles.

in eastern Brazil—where there is a region with rainfall of similar amount and character (along the Bahia coast) in latitude 10° S.

The inhabitants are largely Indian (i. e. Mongolic), negro, and southern European, with various half-castes, and total about 2,000,000, or about 12 to the square mile. Recent immigrants to Brazil total about 3,000,000, about equally divided among Spaniards, Italians, and Germans. The Germans have settled in the temperate regions of Rio Grande do Sul, which is a homoclime of Brisbane. The Italians colonize São Paulo on the tropic, and the Spaniards have spread through neighboring provinces. Few have entered the country which in any way resembles our northern coast lands, so that the South American experience is not hopeful for close white settlement north of latitude 15° S. Bahia and Cooktown have about the same average temperature of 76° F., and this line of evidence seems to point to their being the northern limits of important white settlement.

With regard to the narrow northern coast lands (F), where there is a copious summer rainfall and a possibility of irrigation, we have seen that

many valuable products are grown in the somewhat similar regions of Madras, Bangkok, etc.

But there seem to be no regions of such uniform heat and low elevation that are settled by white farmers, and the prospects of this being done in Australia are very slight.[6] Two factors alone suffice to render such close settlement improbable. These are the large areas of cooler country which will long await settlement, and the enviable conditions attending manual labor in the rest of Australia.

It is unnecessary to discuss the effect on these lands of more frequent communication (whether by rail or sea, or of possible markets in the south or east, or of fostering bonuses, or even of mechanical cultivation. Probably none of these can overrule the fundamental law controlling settlement—that no one will occupy distant and unfamiliar regions who can gain a satisfactory living under more attractive circumstances.

Hence, we may conclude that close white settlement is impossible under present conditions. No estimate of the future population of this type of country (F) can, therefore, be given.

Other possibilities—not contravening the White Australia policy—are outlined in a previous section.

Factors Controlling Future Settlement

A logical conclusion to the presentation of the resources of the tropics given in this paper is to plot the assets in the various regions, so as to obtain a sort of contour map in which the various contours (or "isoiketes") represent degrees of habitability.[7] It is believed that the map constructed to this end will be of value even though it depends largely on the personal equation of the investigator.

TABLE IV—Relative Importance of Factors Controlling Settlement

	Factor	Tentative weight
A	Temperature (including elevation)	15 per cent
	Rainfall (including humidity)	15 "
B	Metals	10 "
	Coal	10 "
	Agriculture	15 "
	Pasturage	5 "
	Timber	10 "
C	Communications (steamer, rail, etc.)	5 "
D	Present population	5 "
	Health	10 "

In the first place, we have to determine the factors controlling settlement, their order of importance, and the weight to be assigned to each of them. The ten factors enumerated in Table IV will be admitted by everyone to be important.

[6] The Official Report for the Territory for 1917 states that there are only ten agricultural settlers on the land.

[7] A new term is needed in economic geography to express such lines of equal habitability. "Isoikete" (from *οἰκητός*, habitable) is suggested.

Now we have to apply these factors to each of the various regions. How important is temperature (or rainfall, or metals, etc.) in controlling settlement?

It is to be noted that we are not asking, What is the chief control in each region? Hence we must be prepared to give pastoral potentialities a very small place, even though they are the most promising features of the tropics. Thus the farms of the Herberton district, or the coal of the Clermont district, must lead to a much larger population than the grazing of the Victoria River, valuable though it may be; and the former are to be weighted accordingly.

Temperature and rainfall are the fundamental controls and so must be mentioned separately, although their control is also indirectly included in the factors agriculture, timber, etc.

Criticism can be leveled at every one of these weights; but probably any common-sense scheme of weighting will lead to much the same arrangement of isoiketes as is shown in Figure 23.

In Table V the factors controlling settlement, enumerated in Table IV, are applied to the natural divisions of tropical Australia, as outlined

TABLE V—TENTATIVE SCALE OF SETTLEMENT FACTORS

	See Fig. 2	Temp. 15	Rain 15	Metals 10	Coal 10	Agric. 15	Pasture 5	Timber 10	Railway 5	Populat. 5	Health 10	Total
COAST LANDS:												
W. A. West coast	a	7	7	7	0	2	2	1	2	1	3	32
North coast	b	5	10	0	2	2	2	3	2	1	3	30
N. T. West coast	c	5	8	7*	2	4	2	3	2	1	3	37
North coast	d	5	8	1	0	4	2	3	1	..	3	27
W. Gulf coast	e	5	10	0	0	4	2	2	2	..	4	29
Q. S. Gulf	f	6	10	0	0	3	3	2	2	1	4	31
E. Gulf	g	6	8	0	0	4	1	2	1	..	3	25
Townsville	h	8	10	7	2	8	3	10	4	3	3	58
Fitzroy	i	9	12	10	3	10	5	9	5	4	6	73
W. PENEPLANE:												
W. A. Kimberley	j	5	10	6	0	2	3	3	2	..	4	35
Sand Ridge	k	8	6	2	0	0	1	1	1	..	3	22
Pilbarra	l	6	6	7	0	0	2	2	2	1	4	30
N. T. Tanami	m	7	6	5	0	0	1	1	..	..	3	23
Macdonnell Ra.	n	9	7	5	0	2	3	1	1	..	4	32
UPLANDS:												
N. T. Victoria River	o	7	10	4	0	4	5	2	1	..	4	37
Arnhem	p	7	9	3	0	2	2	2	1	..	3	29
Central	q	8	9	2	2	3	2	2	2	..	5	35
Frew	r	9	8	4	0	0	3	2	1	..	6	33
Barkly	s	9	9	0	0	4	5	2	1	..	5	35
Q. Boulia	t	9	7	0	0	0	4	1	2	..	5	28
Selwyn	u	8	8	6	0	2	5	3	3	2	6	43
Winton	v	9	9	2	0	2	5	5	3	2	7	44
E. HIGHLANDS:												
Q. Peninsula	w	7	10	6	2	4	3	5	3	1	4	45
Atherton	x	12	15	10	4	12	5	8	4	3	9	82
Hughenden	y	10	12	4	4	4	5	8	4	3	8	62
Peak Ranges	z	11	13	7	8	10	5	8	5	2	8	77

* Including most of Pine Creek mines.

in Figure 2. Some one region can usually be found to have been marked with the maximum for any given factor. Thus Atherton comes nearest ideal circumstances in many of the factors, such as rainfall, temperature, agriculture, and health. The Peak Ranges region contains good coal, which

is indicated, and the Townsville division contains valuable softwood forests. Health is judged from the climographs and from prevalence of disease, etc. Places having good railway communication are ahead of those served by steamers, and the latter are better than the inland localities, such as Tanami, with no regular traffic.

The totals given in the final column are plotted on the regions shown in Figure 2, and lines (isoiketes) are drawn through those regions exhibiting equal values. We thus obtain Figure 23, which presents several interesting features.

There is a center of great potentiality along the eastern Queensland highlands and a center of low potentiality in West Australia. Another

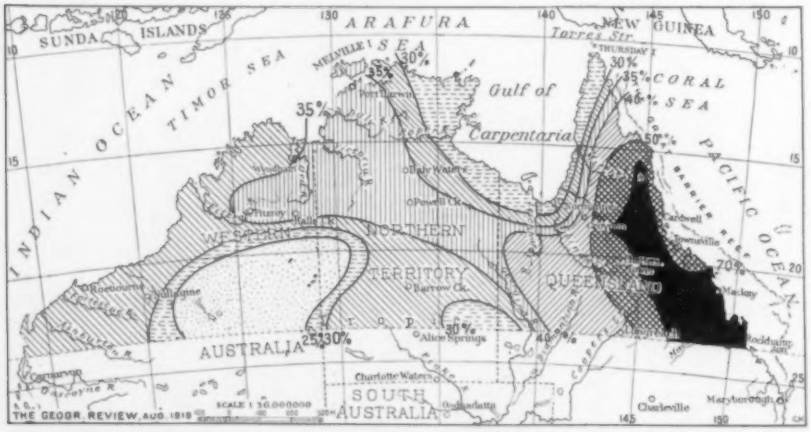

FIG. 23—Potentialities of moderate settlement in tropical Australia. The maximum (black) represents perhaps six people to the square mile. The minimum (dotted) has no possibilities of moderate settlement. The figures are percentages, where the maximum (100) represents an area with all the advantages described in the text. The distribution lines have been termed "isoiketes".

low area seems to surround the Gulf of Carpentaria. A tongue of favorable country extends from Queensland across to the Kimberleys, which certainly indicates that the railway should traverse the Barkly region rather than the center of the continent. The isoiketes are very crowded in the Peninsula—showing a rapid deterioration in values as we proceed from Herberton to the Gulf.

Ultimate Population

It is almost impossible to give concrete figures to these areas. We may assume that the black region will ultimately support from four to eight people to the square mile, on the analogies already considered. We may be sure that the dotted area will never reach one to the square mile under present methods of world settlement, for no similar region anywhere has an important population.

Although the absolute values are doubtful, we may assume that the values shown by the isoiketes are substantially in the right order. Indeed,

we may hazard absolute values. Thus, if the isopleth 80 (not shown in Fig. 23) be taken to represent about eight to the square mile and the isopleth 35 to represent about one to the square mile, for reasons already given, we get the empirical values given in Table VI.

TABLE VI—Estimated Future Population

Lines of habitability	Approx. density	Approx. area	Estimated future population
80 per cent isopleth	About 8 per sq. mi.	12,000 sq. mi.	100,000
70 " "	" 6 " "	90,000 "	500,000
50 " "	" 3 " "	90,000 "	250,000
40 " "	" 2 " "	150,000 "	300,000
35 " "	" 1 " "	250,000 "	250,000
			1,400,000

This figure of 1,400,000 people refers to a future period when the whole of the good pastoral country of the tropics shall be far more closely settled than is, for instance, central Queensland at present (see Fig. 24). It is no

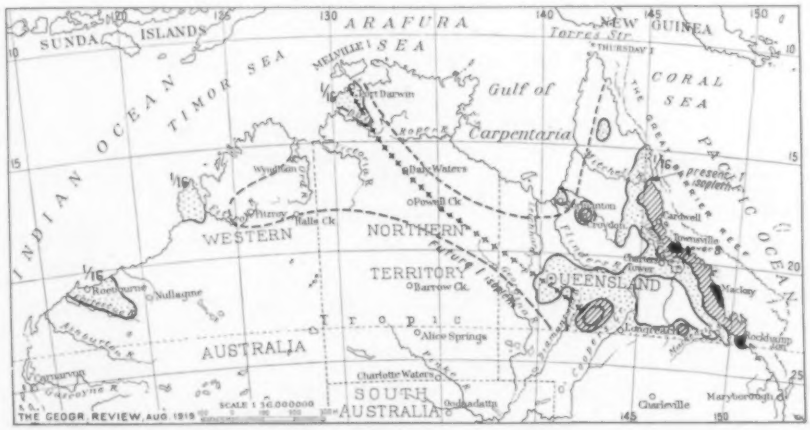

Fig. 24—Present population (based on Knibbs). Dotted areas have over 1/16 person to the square mile; ruled areas over 1 person to the square mile; black areas over 8 persons to the square mile. It is suggested that the one-person area will ultimately increase to the broken line. (The natural land route to Port Darwin is shown by crosses).

utopian forecast but calls for much more advanced cultivation and grazing methods than have hitherto been necessary to secure satisfactory returns. Probably a century or more will pass before this condition is reached.

To ensure these results one cannot suggest any royal road. The eastern portion (east of long. 145°) would seem to be progressing steadily through private enterprise. But in the western and central portions the improvement (in part by public moneys) of transport facilities by permanent waterways, by stock routes, by light railways, and, in fact, by every method that will convert these regions into fully developed pastoral holdings cannot be too strongly insisted on. To an impartial observer, the needs of mining men and the doubtful problems of tropical white agriculture should be left to a later date—if the Commonwealth's aim be to establish settlement rather than to grow rich speedily.

THE SECOND THULE EXPEDITION TO NORTHERN GREENLAND, 1916–1918

Among the twentieth-century Arctic explorers the name of Knud Rasmussen is one of the best known. Half Eskimo, half white, he has known how to travel and live in the native way as no other man has learned it except Stefánsson. His second "Thule" expedition, just completed, is worthy of the first. On this journey, in 1912, he had established the connection of Peary Land with the main mass of Greenland by explorations at the head of Independence Fiord on the eastern side of northern Greenland.[1] *To reach the head of the fiord he had crossed the entire breadth of Greenland over the inland ice.*

On the present journey Rasmussen accomplished the equally bold feat of skirting the margin of northwestern Greenland, partly along the land fringe, partly on the inland ice. He penetrated deep fiords under extremely hazardous conditions of travel, with little game to be found, and returned to Etah in a starving condition, having lost two of his men—one, Olsen, by accident, and another, Dr. Wulff, through starvation.

The information that he was able to gather on this last journey about Eskimo migrations and on the physical and plant and animal geography of the coast is worthy of a place beside the best researches in Polar exploration. A summary of the results was published in the Geografisk Tidskrift *of Copenhagen (Vol. 24, 1917-18, No. 6, pp. 215-232) and is here translated and condensed by the editors for the* Geographical Review. *The present article contains the narrative of the expedition; a second article, to appear in the next issue, will deal with the scientific results.*

NARRATIVE OF THE EXPEDITION

By KNUD RASMUSSEN

The Second Thule Expedition[2] started April 1, 1916, from Copenhagen on the steamship *Hans Egede* for the purpose of carrying out one of two projected plans: (1) the examination and mapping of the large fiords on the northern coast of Greenland or (2) the examination and mapping of Melville Bay. By staying longer in Greenland than intended the expedition succeeded in carrying out both projects.

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1 Knud Rasmussen: Report of the First Thule Expedition, 1912, *Meddelelser om Grønland*, Vol. 51, No. 8 (=pp. 285-340), Copenhagen, 1915 (reviewed in the *Geogr. Rev.*, Vol. 2, 1916, pp. 65-66; see also the article "The Non-Existence of Peary Channel" in the *Review*, Vol. 1, pp. 448-452).

2 A preliminary note, by W. E. Ekblaw, on the Second Thule Expedition appeared in the September, 1918, *Review*, p. 286.—EDIT. NOTE.

Exploration of Melville Bay

The expedition went ashore at Godthaab on April 18. While the airline distance from there to Melville Bay is only 11 degrees (64° N. to 75° N.) the unfavorable ice conditions lengthened our actual voyage to nearly 2,250 kilometers. The journey was made by boat and sledge. It was hard going in northern Greenland on account of the mild winter and an early spring which resulted in our having neither real winter ice nor open water. For long distances there was great difficulty with the sledges. With the help of buoys these were made amphibious so that they might float in case the ice broke around them, as often happened. Because it was necessary to reach Melville Bay while winter ice was favorable, the march was forced day and night. By June 4 we reached Devils Thumb in Melville Bay.

We spent two weeks, June 4 to June 17, in examining Melville Bay. The members of the expedition who took part in this work were: Lauge Koch, cartographer and geologist; the Greenlander Tobias Gabrielsen, who had been a member of Captain Koch's sledge journey to the northern point of Greenland on the *Danmark* expedition; and the writer, as leader and ethnographer.

Lauge Koch succeeded in mapping Melville Bay completely in its whole extent of about 500 kilometers, while I made a thorough examination of the earlier conditions of habitation, locating more than 50 house ruins. Detailed maps were made of the most important settlements, and measurements taken of the better conserved houses and graves. In order to prevent destruction, warm water was used to uncover objects. The examination of the settlement conditions of Melville Bay procured much material that will be of value in understanding the Eskimo migrations to southern Greenland along this trail.

Local Ethnological Investigations

From July 1 to October 1 various local investigations were carried out by Peter Freuchen, Lauge Koch, and myself in the environs of Thule (on North Star Bay, Wolstenholme Sound). At a later time data will be produced relating to all the old settlements from Cape York to Etah. Koch and Freuchen have made a detailed map of the largest of these settlements, Umanaq in Wolstenholme Sound, that shows about 60 house ruins, a number of graves, many tent rings, meat caches, etc. Many of the ruins were measured.

With the aid of Captain Comer, of the Crocker Land Expedition, a large kitchen-midden was dug out in Umanaq. At the bottom of this was uncovered a layer of whalebone, which proves that the Greenland whale had formed what might be called a culture-base, that has become extinct and even forgotten.

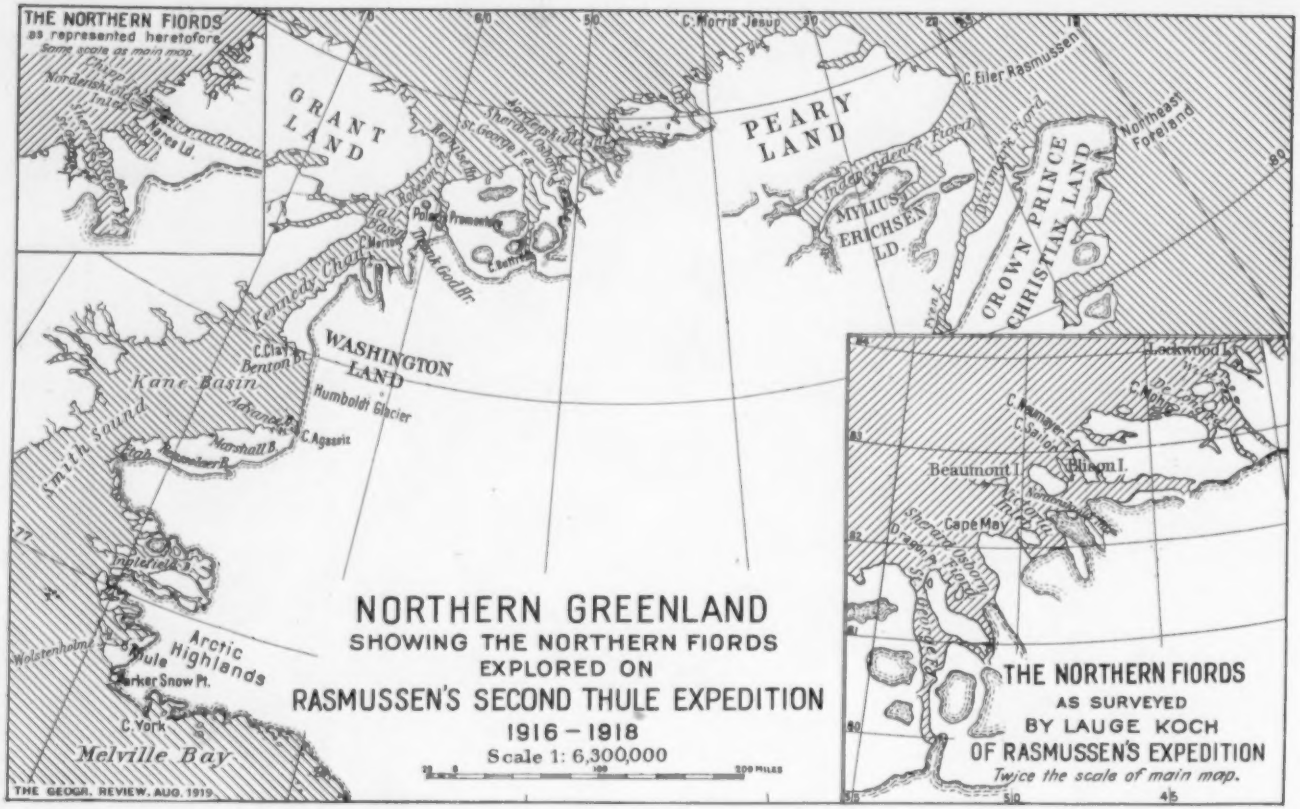

FIG. 1—(For the newly explored parts based on a map by Koch accompanying the article cited in the text.)

The Northerly Expedition: Its Organization and Objects

In October, 1916, after the ice had settled, several journeys were made to Melville Bay for the purpose of supplementing the map and ethnic material obtained on the spring journey. But the main object of the expedition was the sledge journey to the northern coast of Greenland, to the large fiords and to Peary Land. This was accomplished from April 6, 1916, to October 20, 1917.

The Second Thule Expedition, like all my earlier voyages, was a "hunting expedition" on which the food had to be procured by hunting, emergency rations only being carried. This I was able to do because of the experience I had gained in 1912 in the Nabo districts on the eastern side of Greenland. I counted especially on seals in the large fiords and musk-oxen on the extensive upland which, on American maps,[3] was shown about the fiords. Eskimos who had traveled with American expeditions at the mouths of the fiords which we wished to enter had informed me that the ice conditions there allowed one to count on seals in June and July. This and my own experience led me to believe that hunting would enable one to prolong a stay. On the upland were musk-oxen also, a circumstance which had enabled Peary in 1900 to save the lives of his comrades by a single hunt near Cape Wohlgemuth.

The members of the more northerly expedition were:

Thorild Wulff, botanist
Lauge Koch, geologist and cartographer
Inukitsoq, Eskimo hunter
Ajago, Eskimo hunter
Nasaitordluarsuk, called "Boatman," Eskimo hunter
Hendrik Olsen, South Greenlander, late member of the *Danmark* expedition of 1906-1908
Knud Rasmussen, leader and ethnographer.

It was planned: (1) to map the large hitherto unexamined fiords: St. George Fiord, Sherard Osborne Fiord, Victoria Inlet, Nordenskiöld Inlet, Chipp Inlet, and De Long Fiord; (2) to make a botanical and geological examination of these districts, the most northerly land on earth; (3) to make an ethnographical examination of traces of an earlier Eskimo migration northward around Greenland to the eastern coast.

All these objects were accomplished. Very important geological and botanical collections were brought home, and the ethnographical examination failed to disclose any signs of an earlier settlement.

From Thule to the district of our work is more than 1,000 kilometers. In order to cover this ground as quickly as possible, we started with large and strong teams, a total of 6 sledges and 72 dogs. On the first part of the journey extra sledges were employed to carry the heavy narwhal and walrus

[3] The standard representation is: Baffin Bay to Lincoln Sea, Polar Regions, showing the recent discoveries by Civil Engineer R. E. Peary, etc., 1:1,400,000, U. S. Hydrographic Office Chart No. 2142, Washington, 1908.—Edit. Note.

meat to be used as provision for us and the dogs until we reached Nordenskiöld Inlet. Like my first expedition this was organized entirely in Eskimo style and based on their technique of journeying. Stress was laid on ammunition and whaling and sealing gear. Nearly 130 pounds of pemmican were destined merely for use on the return trip over the inland ice.

At the start of the expedition we had 27 sledges and 354 dogs, which were gradually sent home when the amount of provisions and dog food diminished. The last extra sledges left us as far up as Hall's grave near Thank God Harbor.

From Thule to Sherard Osborne Fiord

We started from Thule on April 6 and on April 22 we had already passed Humboldt Glacier and reached Washington Land. At Cape Morton, 81° N., we found an old depot of the *Discovery*, Nares' expedition ship. This depot, abandoned in 1875, consisted of 56 two-pound tins with fresh mutton which we enjoyed very much.

From May 2 to May 6 we traveled around the sharp northwestern corner of Greenland through large ice masses, over which we had to make our way with the help of ice-picks. At Repulse Harbor we found a cairn established by Peary in 1900. On May 7 we reached Dragon Point at the mouth of St. George Fiord. A cairn was found here that contained a detailed account by Beaumont, the first explorer in this region. It was dated May 25, 1876. There we placed a depot consisting of 50 pounds of pemmican, 50 pounds of biscuits, 30 pounds of rolled oats, coffee, tea, and sugar, to be used on our return from St. George Fiord. Near Sherard Osborne Fiord we found much deep snow, as was the case later in every fiord we came to. From here the expedition had to travel on foot for several months, as travel with dogs was impossible.

The Northern Fiords

When we reached the large fiords, where our work was to begin, we discovered that the land which was supposed to exist around Victoria Inlet and Nordenskiöld Inlet did not exist at all. This meant that we should not have the expected hunting. We therefore killed half of our dogs as soon as we could afford to do so. On May 19 we observed the first seal on the ice near Dragon Point. This assured us of good hunting, if only we could get ahead far enough during the spring. The work to be accomplished by the expedition required not only time, but also the coming of summer. When mapping the large fiords we had to skid ahead through snow, though this snow had to melt before we could do our botanical work. But even as late as July 1 we were able to proceed only with the help of snowshoes.

From May 8 to June 22 the large fiords from Sherard Osborne Fiord to De Long Fiord were mapped, though we were all the time fighting for food; and from May 6 to July 1 we waded in snow and during July in water, up

to the knees. We were convinced that a longer stay here must be disastrous, but all the members agreed to take the risk rather than turn southward with only half our task accomplished.

Only in very few places on the entire journey did we find favorable musk-ox hunting. In a few valleys between Cape May and at the mouth of Victoria Inlet we shot 40 musk-oxen. The great difficulty of traveling with loads prevented us from carrying the musk-ox meat with us. It was only valuable to us in so far as we could eat it on the spot. At all other places on the northern coast we hunted in vain for musk-oxen. Sometimes we shot hare and grouse. But it was difficult to feed our dogs, now numbering 20, which were necessary to draw our collections and provisions.

Long hunting trips were without any results. We should have been obliged to sacrifice our dogs very early, had we not now and then captured a seal. Three of these we discovered at an open stretch or "lead" extending 30 kilometers inside Chipp Inlet, and two others we shot between Cape Neumayer and Cape Mohn. This made it possible for us to map De Long Fiord from June 20 to June 23. This fiord had three main arms, of which the most easterly was the longest. At their heads lies a high, ice-covered upland, where it is not possible for big game to exist. With the mapping of this very interesting fiord the expedition succeeded in proving that no channel exists leading from here toward Independence Fiord in the direction of the formerly supposed Peary Channel.

Results of Our Surveys

Here, at the "farthest north" of the expedition, we will briefly sum up the most important cartographical and geographical results. A comparison of the accompanying sketch map (Fig. 1) with the previous representation of the region (see upper left inset, Fig. 1) shows the following: a large ice-free land around St. George Fiord and ice-covered districts in the direction of Peary Land—exactly the opposite of what was before believed to be the case. So the large ice-free districts around Victoria Inlet and Nordenskiöld Inlet must be eliminated from the map, as the districts shown on the earlier maps as Nares Land are inland ice. Chipp Inlet, which was supposed to run parallel to Nordenskiöld Inlet, does not exist; but north of Nordenskiöld Inlet is a new fiord extending eastward for about 50 kilometers into Peary Land.

Nordenskiöld Inlet, which was believed to form the mouth of the so-called Peary Channel leading to Independence Fiord, proved to be a short fiord, only 20 kilometers long, the head of which ends in a glacier. If Peary believed he was looking into a deep channel, then he made a mistake, which could easily have occurred in passing the fiord at sea, as Peary did. From the outer coast near Cape Sailor one really seems to be looking into a large fiord, because the glacier that forms the head of the fiord is con-

tinuous with the fiord ice, and the nunatak hills at the fiord head appear to be a continuation of the land at the mouth of the fiord.

Victoria Inlet also has been taken to be a deep fiord that reached far into the ice-free land. Here, just as in Nordenskiöld Inlet, we have inland ice continuing the sea ice, and, when seen at a distance, this gives rise to incorrect inferences. The head of Sherard Osborne Fiord likewise consists of flowing inland ice, the so-called *sikûssak*, which ascends gradually and ends at the ice cap near Cape Buttress. This flowing inland ice overthrows all the earlier theories that there existed here the means of subsistence for the Eskimo. The manner in which this has affected the problem of migrations around northern Greenland will be treated in detail at another time.

The Return

On our return trip, June 26 to June 30, we managed to kill nine seals near Cape Sailor (Elison Island). Thus we had food for ourselves and our dogs before we started on the march through water and melting ice to Sherard Osborne Fiord, where we expected to find favorable conditions for seal-hunting. For twelve hours a day during one month we were wet up to our waists, but we had to go on, because St. George Fiord was the only place where we could ascend the inland ice. In order to preserve our collections and films from destruction by water, we had to build platforms on our sledges. The ice of Sherard Osborne Fiord was in splendid condition, and only when we had to go ashore, near Dragon Point, to fetch provisions from the depot for our return trip, did we observe that the abundance of melted ice during the last three weeks had caused a wide belt of open water to form between the land and the fiord ice. In this water were all the seals; but they did not come upon the ice as they are in the habit of doing everywhere else in Greenland at this time of the year. There was no use shooting them in the water because they went down like stones when hit.[4] Thus we managed to kill but two seals in a region in which we had expected to have the best hunting before we came to the inland ice. On land, near the place where we ascended the inland ice, we found only now and then a wolf, and these never came within the range of our rifles.

Death of Olsen

The expedition was now to lose the Greenlander Hendrik Olsen, who perished through unknown circumstances on a hare-hunting trip 20 kilometers south of Dragon Point on July 21. After waiting and searching four days in vain, we continued our journey, to stop again for twelve days 35 kilometers distant from the place where we should have met Hendrik. On the 24th we agreed that it was impossible to stay longer at that place,

[4] In this connection it is interesting to refer to the section on "Hunting Seals in Open Water" in Stefánsson's article in the May *Review* (Vol. 7, 1919), pp. 301-302 and Figs. 6 and 7.—Edit. Note.

where we were unable to find food for ourselves and our dogs. Cairns were placed at three different locations containing letters, maps, clothing, and provisions.

We can only guess the manner in which Hendrik perished. He may have drowned in a river or may have shot himself accidentally by falling into a crevasse or may have been attacked while asleep by a wolf, of which we observed a great many in this region. We were all very much moved by the loss of our dear comrade, and, before we left St. George Fiord, we built a cairn at which I made a speech in Danish and Greenlandish.

Dearth of Food

To add to the depression caused by the loss of our friend came other obstacles of a serious nature. We were starving in a deserted region where storms, rain, and thickening snow hindered our march to the inland ice, whence we were to start our journey homeward. We were able to find food from day to day, but there remained the problem of procuring reserve provisions for our long march over the inland ice, the shortest route and the only one possible for the transport of our scientific collections. It would have been impossible to carry them south over the snowless and rough coastland.

To be sure we had a few portions of meat left from our successful hunting near Cape May and the two seals we shot in St. George Fiord, besides 48 pounds of pemmican, about 40 pounds of biscuits, and about 20 pounds of rolled oats, coffee, and tea. But we starved in order to save our provisions for the journey over the inland ice. Though we killed a few dogs we had fourteen left for the two sledges.

The distance we had to cover over the inland ice to the nearest land south of Humboldt Glacier was 435 kilometers, which would not have been difficult had we been in good form with sufficient provisions. We had pemmican, biscuits, and rolled oats for 16 days on half rations. The seal meat and musk-ox meat that should have been our food we had to use to feed our dogs. In our run-down condition we did not wish to draw the sledges ourselves. The muscles of our legs were very weak from wading through ice-water during the month of June. Our meat, used as dog food, would last ten days, and, after our own provisions gave out, we could live on the dogs.

South Over the Inland Ice

On August 5 the weather became clear, and we started over the inland ice with all our materials and provisions stored on the sledges. Our hope of getting quickly to the land south of Humboldt Glacier was not realized, for after three days we came to a deep cleft, which we named "Djaevlekløften" (Devil's Cleft). It took us two days to get to the other side of this crack, formed by steep nunatak rocks. After another two days we arrived at a snowless plain, 20 to 30 kilometers in width, that reached from

St. George Fiord to Sherard Osborne Fiord and therefore could not be flanked. Again we lost two costly days by carrying our baggage and also the sledges to the main ice cap, which we reached on August 10. From then to the 21st we had easy going. We traveled as fast as we could and, in spite of being underfed, covered 35 kilometers daily on an average. On August 21, having eaten our last provisions, we sighted the land south of Humboldt Glacier 30 kilometers distant with still five dogs on which to subsist.

This was our position when in the afternoon there came a southwest wind with rain. Thereupon the ice broke up on the numerous rivers near Humboldt Glacier, and the streams became torrents. We fought these for four days. Tied to each other with seal straps, transporting our collections and materials over the slippery ground, we traveled by devious ways. Wading in wet clothes all day made us very weak, especially as we now lived only on dog meat, which was not very nourishing. Finally, on the evening of August 24, we reached Cape Agassiz, on the very day when we had eaten our last dog.

Arrival at Cape Agassiz

Our arrival here meant safety. The region is known to the Eskimos under the name Qaqaitsut, "the land without hills," and is visited every fall by reindeer and hare hunters from Etah and its environs. We observed quite a number of hare. Our three Eskimos went for a hunt, and Ajago returned after a few hours with five hare, while the other two Eskimos continued to follow the fresh trails of reindeer. Our fight for food seemed to be over, and now we had to get in communication with mankind as soon as possible. We had no clothing or ammunition for a longer stay, and had to be careful to reach in time the ship which we expected to find waiting for us near Etah.

We decided that Ajago and I, who were less weak than the others, should head for Etah, 225 kilometers distant, in order to organize a relief expedition. Both Wulff and Koch were in very bad shape, but we left with them two clever hunters, Inukitsoq and Nasaitordluarsuk, to provide food. The country here is made up of many rock hollows, cut by clefts and filled with small lakes. Since it would be difficult to find our friends in such a place, we decided that they should travel slowly forward to the large lake behind Marshall Bay, known to all Eskimos, where we could easily find them. Ajago and I left Wulff and Koch on August 25, before Inukitsoq and Nasaitordluarsuk had returned from their hunting trip.

Relief from Etah

We advanced with very little rest through difficult terrain about 150 kilometers, when, on the afternoon of the 29th, we met the reindeer hunter Miteq from Inglefield Gulf. It was no use returning to our comrades, as

Miteq had provisions for only two or three days and besides we might have missed our friends, as, according to our plans, they would have left our own camp going south. Therefore we did not change our plan, which was to procure effective help as quickly as possible from Etah. We reached Etah on the evening of August 30. During the night five relief sledges with plenty of provisions and necessities started for the rescue of our friends.

On the following day the sledges were on the inland ice and searched the large lake back of Marshall Bay. Here two cairns were to be placed, at which two men were to stay, while the other three should search the land farther north in special directions. The relief sledges found our comrades on September 4 after a two-day journey north of the large lake, but, to our great sorrow, too late to rescue Dr. Wulff, who had died under the terrible strain of the voyage. The death of our friend moved us very much. All of us, and especially Dr. Wulff, had been convinced that our arrival at Inglefield Land meant the rescue of the whole party.

Death of Dr. Wulff

But after Ajago and I had left Koch and Wulff, it developed that Dr. Wulff was much weaker than he appeared to be at our departure. He had always been in good condition, even when we lived on half rations, but when we had to use dog-meat as food, he grew weak. In spite of this I believe he would have pulled through, if he had not suffered from lack of blood in the brain and pains in the heart. Then he wrote his last letter to me and died. The letter, which I received through Koch, begins:

> My dear Knud,
>
> The unceasing hunger during the summer and the hardships of the last days have brought me down and taken all my energy, so I am unable to follow Koch and the Eskimo any longer. As their rescue depends on a quick advance to favorable hunting grounds, I should only be a burden. Therefore, in full possession of my faculties, I say good-by and thank you for your comradeship during the expedition. I hope that all of you, as well as the results of the expedition, may be saved.

These words may well serve as his own epitaph and may, together with his excellent botanical materials, preserve his name as long as there exists on earth an interest in solving scientific problems.

The relief sledges brought Koch, Inukitsoq, and Nasaitordluarsuk to the Eskimo settlement at Etah, where we remained in order to gain strength, so as to be able to continue our voyage in the course of the fall or winter to Holstenborg. Thence we intended to sail for home by the Royal Greenland commercial steamer *Hans Egede*.

CRETE AND ATLANTIS

By PHILIP COOMBS KNAPP

In the world-old antithesis between reason and imagination, between the poet and the scientist, there are those who still seek a sea coast in Bohemia, who still strive to fix the latitude and longitude of Prospero's enchanted isle, who still try to find Robinson Crusoe's cave and the footprints of Friday on Juan Fernandez. Their identification of Atlantis with some existing region seems equally visionary

Plato's Description of Atlantis

Having depicted his ideal state in the "Republic," Plato, in his "Timaeus," goes on to show how his ideal state would conduct itself in some great struggle and, to this end, relates the tradition of the most famous ancient action of Athens, 8,000 years before—the overthrow of the island of Atlantis. There was a

> mighty power which was aggressing wantonly against the whole of Europe and Asia . . , an island situated in front of the straits which you called the columns of Heracles, . . . larger than Libya and Asia put together, and was the way to other islands; and from the islands you might pass through the whole of the opposite continent which was surrounded with true ocean; for this sea which is within the straits of Heracles is only a harbor . . . In this island of Atlantis there was a great and wonderful empire which . . . subjected the parts of Libya within the columns of Heracles as far as Egypt and of Europe as far as Tyrrhenia.

In the "Critias" Plato once more describes Atlantis as having been allotted to Poseidon, who begat several children by a maiden Cleito, living in a mansion there which he enclosed by "making alternate zones of sea and land larger and smaller, encircling one another . . . equidistant every way, so that no man could get to the island." After giving the names of all the children Poseidon had by Cleito and describing the great riches and abundant products of the land, animal, vegetable, and mineral, Plato describes the arrangement of the country.

> They bridged over the zones of sea which surrounded the ancient metropolis . . . and dug a canal of 300 feet in width and 100 in depth and 50 stadia in length which they carried through to the outmost zone, making a passage from the sea up to this, which became a harbor . . . Moreover, they divided the zones of land which parted the zones of sea, constructing bridges . . . Now the largest of the zones into which a passage was cut from the sea was three stadia in breadth, and the zone of land, which came next, of equal breadth; but the next two, as well as the zone of water as of land, were two stadia, and the one which surrounded the central island was a stadium only in width. The island in which the palace was situated had a diameter of five stadia.

Plato also gives in great detail the composition of the walls, the character and arrangement of the buildings, the nature of the country, the popula-

tion, and the form of government. After Athens had defeated Atlantis the whole island was sunk by an earthquake which left "an impassable barrier of mud to voyagers sailing from hence to the ocean."

I have quoted liberally from Plato's description—which, as he gives it in the "Critias," is much more detailed and elaborate—in order to show the mathematical precision with which he describes the arrangement of Atlantis, resembling for all the world the encampment of the tribes of Israel about the tabernacle in twelve camps of precisely similar numbers, as given in the priestly code of the Pentateuch.

The Suggested Identity of Atlantis and Crete

Since Plato's day much search has been made for the site of Atlantis, in every part of the world—America, Palestine, Arabia Felix, Ceylon, Sardinia, and Sweden—but without avail. Of late years the suggestion has been made that the great Minoan Kingdom of Crete was the original of Atlantis. The suggestion, first made by an anonymous writer in an English newspaper, was further elaborated by Mr. James Baikie[1] and recently urged again by Mr. E. S. Balch.[2] Mr. Balch argues that Plato's descriptions might well apply to Crete, once a kingdom of great extent and power, which might readily have ruled over Libya and Europe as far as Tyrrhenia; that Athens and Egypt combined may have put an end to the Minoan Kingdom in 1200 B. C.; and that the tradition of the impassable seas may refer to the cessation of the commerce between Egypt and the Minoan Kingdom.

The cause of the downfall of the Minoan Kingdom remains unknown. It is probable that the destruction of the great palace at Cnossus was a sudden catastrophe and that the destruction of the kingdom was also sudden, possibly, as Mr. Baikie has suggested,[3] a sequel to the overthrow of the Minoan fleet, which for a very considerable period had ruled the waves of the eastern Mediterranean. Although the kingdom was destroyed, Minoan civilization continued to exert its influence throughout much of Greece and the islands of the Aegean. The Achaean invasion may have played some part in the overthrow of the Minoan Kingdom, but Minoan civilization dominated its conquerors. In fact the civilization of Mycenae is now regarded as chiefly of Minoan origin, and Minoan influences are traced even to the mainland of Asia Minor. There is some slight tradition as to the *débâcle* of the Minoan Kingdom, but none as to any physical catastrophe such as destroyed Atlantis, nor is there any geological record pointing in that direction. Furthermore, in the traditional history of Greece, after, of course, the great "matter of Troy," the "matter of Crete" assumes a place second only to the "matter of Thebes." For some reason,

[1] James Baikie: The Sea-Kings of Crete. London, 1910. pp. 256-259 (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 282-283).

[2] E. S. Balch: Atlantis or Minoan Crete. *Geogr. Rev.*, Vol. 3, 1917, pp. 388-392.

[3] *Op. cit.*, p. 176.

too, the expansion of Greece for many years was toward the east, to Troy and Ionia; perhaps, as Mr. Leaf thinks, on account of the power of the Kingdom of Taphos (Corfu).[4]

The Implications of This Theory Not in Accord With Tradition

This theory, that the Minoan Kingdom was Atlantis, seems to demand that the Minoan Kingdom was absolutely destroyed and that memory of it faded away from the mind to such an extent that the possibility of a visionary Atlantis may have replaced it. That the memory of it did so disappear is not borne out by what little we know of the traditions of the period. The dates of the Minoan catastrophe and of the fall of Troy are so vague that we know not which came first; but Crete was still well known to Homer, whose date, uncertain as it is, was certainly later than the sack of Cnossus.

> And of the Cretans Idomeneus, the famous spearman, was leader, even of them that possessed Cnossus and Gortys of the great walls, Lyctus and Miletus and chalky Lycastus and Phaestus and Rhytium, established cities all; and of all others that dwelt in Crete of the hundred cities. Of these men was Idomeneus, the famous spearman, leader, and Meriones peer of the man-slaying war god. With these followed eighty black ships—

a number second only to those that followed Agamemnon. So says the Catalogue of Ships; but elsewhere in the Iliad also Idomeneus holds no contemptible position as a leader, and a part of the Thirteenth Book is devoted to his valor and exploits.

The fame of Idomeneus is not unknown to Hesiod, who has various references to Crete and the extent of the Kingdom of Minos. Similar references may be found also in the Homeric hymns and the Epic cycle.

It was some time after Homer's day that the Mycenaean civilization, with which he was familiar and which was an outgrowth of the Minoan, disappeared under the great northern invasion, and the dark ages of Grecian history begin. That the Hellenic and Athenian civilizations which followed were essentially different is now conceded, but we know little of their origins. It is possible that during this period, some five hundred years after the great Minoan catastrophe, the memory of Crete grew less; but the poems of Homer remained, and Hellenic civilization assumed to be descended from the Homeric age and clung to its traditions and teachings.

Cretan Tradition in Greek History and Literature

Even apart from Homer, however, the Cretan traditions were still preserved. The Greek tragedians, to be sure, made no use of the "matter of Crete" in their extant tragedies; but the historians touch upon matters of Cretan history not mentioned by Homer. Herodotus tells us that the grandson of Minos (Idomeneus?), in defiance of warnings, joined the expedition to Troy and that, in consequence of his absence, his kingdom was

[4] Walter Leaf: Homer and History, London, 1915; see especially pp. 171-192.

invaded and destroyed. Thucydides, as keen an exponent of the influence of naval supremacy as Admiral Mahan, alludes to the fact that Minos was the first to establish it when by his fleet he had made the seas safe against the pirates.

In Greek literature, as it has come down to us, the "matter of Crete" for some reason was never made the special theme of poet, dramatist, or historian. The references to it which we find are merely *obiter dicta*, allusions by writers whose main subject was something different. Enough has come down, however, to show that, so far from Crete and the Minoan Kingdom having faded from human memory to be replaced by a vague tradition of Atlantis, trustworthy traditions of the great Minoan Kingdom reached the age of Pericles almost a thousand years later and must have been known to Plato.

As to the possibility that Athens took part in the attack on Crete, as she is said to have attacked Atlantis, we must be more than skeptical. According to Homer, the part that Athens took in the Trojan War was insignificant; and the history of Athens before and after this war is veiled in obscurity.

Improbability of This Theory

Assuming, however, that we had no record of Crete after the fall of Cnossus and that the memory of the Minoan Kingdom had faded utterly from the Greek mind, it is hardly probable that Crete was cut off from all communication with the mainland as was Atlantis. It is not unlikely that, after the great sea fight that must have preceded the destruction of Cnossus, Minoan commerce was destroyed and piracy revived; but not long afterward navigation itself revived. Soon after the Trojan War the Greeks began their eastward migrations, colonizing the Ionic cities in Asia Minor. Phoenicia was journeying westward at least to Tarshish and Gades, if not outside the Pillars of Heracles; and later still Greece began to plant colonies in Marseilles and Syracuse. With such extensive movements of the nations in the Mediterranean it is hardly possible that they could have passed by Crete, ignoring its existence. Indeed, tradition tells us that after the destruction of Cnossus the northern tribes began to occupy Crete.

The "Timaeus" is, in a way, a continuation of the "Republic." There Plato had described his ideal state. He goes on in the "Critias" to describe a state laid out with wonderful exactness and regularity—a state that seems, from the fragment, to be literally as utopian as his Republic. He is rather fond of references to Egypt. Phaedrus says to Socrates: "You can easily invent tales of Egypt," and so Plato ascribes the origin of this imaginary island of Atlantis to a tale of Egypt.

GEOGRAPHICAL RECORD

NORTH AMERICA

Present Immigration into the United States. The "Annual Report of the Commissioner General of Immigration for the Fiscal Year Ended June 30, 1918" (Bureau of Immigration, U. S. Dept. of Labor, Washington, D. C., 1918), presents official statistics showing how completely the great migratory movement to America has been checked and also gives some interesting figures regarding the elements that continue to arrive. The immigration into the United States, whose annual average for the decade immediately preceding the war was 1,218,480 persons, has been reduced to the relatively insignificant number of 110,618. The recent restrictive legislation has consequently had little opportunity for operation, though it did account for a slight decrease, 7,297, or 3.3 per cent, of the applicants for admission being rejected, 23 per cent of these owing their exclusion to the new law. The above figures actually represent little addition to the permanent population of the country, since during the year 94,585 aliens emigrated, 14 of the 40 nationalities listed showing a greater number of departures than arrivals, the net gain being only 16,033. Taken as a whole the number of immigrants was the lowest since 1844, with the one exception of the year 1862, when only 72,183 arrived.

Though obviously it would be unsafe to draw conclusions regarding the future of immigration, either as to its numbers or its racial characteristics, from the statistics for the past few years, which merely reflect the abnormal conditions existing both in America and abroad, yet it is of interest to note that during 1918 the countries from which the greatest numbers of persons arrived in the United States were the following: Great Britain, Mexico, Japan, Scandinavia (including Denmark), and Spain. In the excess of arrivals over departures (leaving out of account the so-called non-immigrant and the non-emigrant, i. e. travelers, temporary residents, etc.) a different order of races and nationalities is noticeable. Here the Japanese, with an excess of immigrants over emigrants of 8,610, were in the lead; followed by Africans (black) with 4,415; Scandinavians with 4,076; and Spaniards with 3,727. On the other hand, among the 14 nationalities whose emigration exceeded immigration (again excluding non-emigrants and non-immigrants) the following led: Mexicans with an excess of departures over arrivals amounting to 7,482; Russians with 3,413; and Italians (South) with 2,901.

That approximately the same general situation has prevailed during the nine months from July, 1918, to March, 1919, is revealed in the *U. S. Immigration Service Bulletin* for May 1, 1919. According to statistics there published the British again led in immigration arrivals, having already passed their numbers for the preceding year. The Japanese have not quite equaled their former rate. Mexicans have slightly surpassed their total for the year 1918, and far fewer Mexicans have emigrated (judging from the number of aliens who have crossed the international boundary southward), thus making the gain apparently more permanent. The total number of permanent immigrants arriving in these nine months was 91,200, while 63,144 aliens permanently emigrated from the country, leaving an increment of 28,056.

The Cold Winter of 1917-18. The remarkably severe winter of 1917-18, with its "record-breaking" low temperatures at many stations and its serious economic effects, especially in connection with the transportation of coal in the northeastern sections, will not soon be forgotten. It was our "war winter" in more aspects than one. Mr. Preston C. Day of the Weather Bureau considers the contributing factors concerned in the development and the continuance of the extreme cold in a recent number of the *Monthly Weather Review* (Vol. 46, 1918, pp. 570–580). In December practically the whole of the North American continent was controlled by an extended area of high pressure central north of the Arctic Circle and accompanied by great cold. Northerly and northwesterly winds prevailed over the United States east of the Rocky Mountains, bringing persistent cold, while warm, generally southerly and southwesterly winds prevailed to the west. An unusually deep and extensive snow cover over much of the eastern United States was an additional factor in producing the extreme cold. During January pressure was below the normal over the southern and eastern sections, with a resulting flow of cold air from the north. This air, passing over the nearly universal cover of snow and ice, kept the temperatures very low. It is Mr. Day's opinion that, given favorable pressure distribution, lasting a sufficient length of time, colder weather

is possible than that which characterized the winter of 1917-18, "without any change in the orderly procession of the forces dominating our weather."

February, 1918, was marked by a uniform prevalence of southerly winds east of the 100th meridian, as a result of which unusual warmth persisted during much of the month. This milder weather brought much relief to transportation and mining interests and also relieved the widespread suffering and discomfort which had resulted from the scarcity of coal and of other fuels.

Mr. Day's article is illustrated by numerous charts showing temperature and pressure distribution and also contains references to some of the many striking economic aspects of the generally severe cold and also of the unusual warmth which characterized certain sections of the country. R. DEC. WARD

An Ecological Survey of the Palisades Interstate Park. It is one of the attractions of New York that there are so near it thousands of acres of rough, rocky land for the most part covered with forest. Probably no other large city in the world has so large an acreage of forests conveniently located as a resort for its people. There has now been published a note on an ecological survey of the Palisades Interstate Park by Dr. Charles C. Adams (*Empire Forester*, Vol. 5, 1919, pp. 12-18, Syracuse, N. Y.), which suggests the manner in which it can best be improved and used. Palisades Park is a narrow strip on the western side of the Hudson reaching from New York to near West Point and westward to the Ramapo River—in all about 35,000 acres of forest. It is chiefly mountain land with clearings in the valleys. Ponds and lakes have been enlarged, roads and trails constructed, and mountain outlooks made. During the summer of 1918 nearly 50,000 people camped in the park on an average of ten days each. In order best to improve the Park special studies have been made of the bird life, the fish, and the forest botany. The results of these studies are to be published in popular form and will make excellent excursion guides to stimulate and direct intelligent interest toward both scenic beauties and wild life.

War Activities of the Blue Hill Observatory. In the annual volume containing the "Observations and Investigations Made at the Blue Hill Meteorological Observatory" for 1918 reference is made, for the first time publicly, to the part which that observatory took in American scientific activity in connection with the war. Near the beginning of the year the Director, Professor Alexander McAdie, was asked by the Navy Department to serve as senior aerographic officer and to undertake the organization of an aerographic service in connection with naval aviation, both in this country and abroad. Professor McAdie, commissioned as Lieutenant Commander in the United States Naval Reserve Force, was sent overseas in April, 1918, with a small group of junior officers who had been trained at Blue Hill. During the year 56 candidates for commissions received instruction at the observatory, 28 American universities or colleges being represented in this number. As the Director says in his introduction to the 1918 volume: "It is a memorable tribute to the far-sightedness of the founder of the observatory that, when the country needed an institution where men might be given opportunity to study the structure of the atmosphere and become familiar with the working of instruments similar to those in the leading European observatories, the need could be promptly met." R. DEC. WARD

EUROPE

Publications on the Military Geography of the Italian Front. As a result of the struggle in which Italy was engaged along her northeastern border during the war, and as an aid in carrying on the military operations in that region, the Comando Supremo of the army issued a series of pamphlets dealing with the military geography of particular points along the frontier. Several of these studies are of decided general geographical interest, as will be seen from the subjects listed below. They cover such matters as the topography, hydrography, temperature at different elevations and different seasons, roads, vegetation, wind direction, humidity, rainfall, snowfall, the danger from avalanches, water supply, the strategic features of the mountains, and relate to such now famous places as the Piave basin, the Asiago plateau, the upper and middle Adige, the upper Isonzo, Monte Nero, the Bainsizza plateau, Il Montello, the basin of Gorizia, etc. Detailed topographic maps, reprints of those made by the Istituto Geografico Militare, accompany some of the pamphlets, while others contain profiles, hypsometric maps and sketches of the topographic features.

AUSTRALASIA AND OCEANIA

Australian Exploration and Its Physiographic Relations. The exploration of Australia was guided by physiographic conditions and climate, and the conflicting reports

of the explorers affected outside opinion in a constantly changing manner. The continent has its fertile portion so disposed that even today most of its people live in a narrow band within a comparatively short distance of the sea. The great interior is either quite desert or primarily a stock country. About 1,000,000 square miles, or one-third of the whole, offers only poor support to flocks and herds. This great area has probably less than 150,000 cattle and sheep or not much more than one per cent of the total stock of the commonwealth. Dr. Griffith Taylor, Physiographer of the Commonwealth Weather Service, has recently published (*Geogr. Journ.*, March, 1919) a valuable analysis of the routes of the explorers in terms of climate and physiography. He discusses all the earlier explorations, including those of Capt. Jansz (1606), Houtman (1619), Carstens (1623), Thyssen (1627), all of whom visited peculiarly inhospitable stretches of coast. The desert thickets, the dry offshore trade winds, the old state of native life, the sterile soil, made a most unfavorable impression.

Tasman was the first circumnavigator of Australia and was the first to visit portions of the country which exhibited other aspects than barren wastes and stunted vegetation. From that time on, explorers' comments on the nature of the land varied with the region visited, and their testimony was conflicting and on the whole affected British readers unfavorably. Cook, in 1770, visited the eastern portions, where the rainfall is heavier, and his report was distinctly favorable. On those portions of the coast discovered by the English are sixty-four of the eighty largest towns in Australia today. Of all the coast explored by the Dutch only a small region (Swanland) is suited for white settlement. The first settlement was made in 1788 on the shores at the fine harbor of Port Jackson, one of the greatest harbors in the world, where there were rich valley lands and bordering cattle pastures. There follow notes on the work of the explorers who penetrated inland, like Cunningham (1823-1827), Hume and Hovell in 1824, and the noteworthy explorations of Mitchell and Sturt, who explored especially the drainage of southeastern Australia from 1830 to 1836. It was in 1836 that settlement was first started in South Australia and exploration proceeded rapidly from Adelaide. Eyre saw Lake Torrens in 1838, a lake which occupies a rift valley of fairly late origin, and in 1841 the same explorer started on his disastrous journey to the Swanland region. In northeastern Australia memorable work was done by Kennedy, who passed along the deeply dissected, eastward-facing scarp fronting the Pacific, where, on account of the heavier vegetation and rugged relief, his expedition met with constant difficulties and dangers. Only by 1862 was the whole of Australia fairly well known, and even then the varying accounts of rainfall and suitability for settlement made scientific exploration a necessity. The contradictory reports are due largely to the unreliability of the rain. One explorer visited a region in a wet year, when there are good pastures, and another visited the region in a very dry year. Only the rather permanent vegetation and the minor surface features, such as sand hills, shallow depressions, and mountains are described in terms that agree in all the accounts.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

UNITED STATES

South-Central States

GITTINGER, ROY. **The formation of the state of Oklahoma (1803-1906).** 256 pp.; maps, bibliogr., index. *Univ. of California Publs. in History*, Vol. 6, 1917. University of California Press, Berkeley. 9½ x 6½.

Though the author of this volume has made no attempt to treat his subject from a geographical viewpoint, in fact usually seems unconscious of the geographical factors that entered into the development of Oklahoma, yet such factors cannot be hidden. They obtrude themselves continually. In each stage of the state's evolution from wild prairie to well-settled commonwealth the influence of topography, river routes, mountain passes, climate, or soil is apparent. Such detailed accounts form an excellent basis for the application of geographical principles.

This work is of peculiar value since it is not limited to Oklahoma alone but describes the political development of the state as an integral part of the great Southwest. The Louisiana Purchase; the formation of Missouri Territory (1812); the migration of Indian tribes from east of the Mississippi and their settlement in the old Indian Territory (then comprising a large part of what is now Kansas, Nebraska, and Colorado); the sweep of white settlement across the prairies; the creation of Kansas and Nebraska out of that larger Indian Territory; the struggle for slave and free states; the Indian's part in the Civil War; and finally the gradual infiltration of whites into the lands allotted to the various Indian tribes, resulting in the spectacular opening up of Oklahoma to settlement and the formation of the present progressive commonwealth—each of these stages is fully described.

Besides being a comprehensive story of Oklahoma's growth into statehood, the work will serve as a guide to the sources of her history and will be of high value to other students in the same field. The author has drawn largely upon the treasure house of United States government documents, as was, of course, necessary since Oklahoma has been until recently under federal control. He has also collected the scattered material in periodical literature and particularly in historical society publications of neighboring states. Thus Professor Gittinger has written a volume which will undoubtedly remain a standard reference work for the history of the state.

MATTESON, W. G. **A review of the development in the new central Texas oil fields during 1918.** Maps, ills., diagr. *Econ. Geology*, Vol. 14, 1919, No. 2, pp. 95-146. Lancaster, Pa.

SOUTH AMERICA

ECUADOR, PERU, BOLIVIA

PERRIER, G., edit. **Mission du Service Géographique de l'Armée pour la mesure d'un arc de méridien équatorial en Amérique du Sud, sous le contrôle scientifique de l'Académie des Sciences, 1899-1906. Vol. 2, Part I: Atlas. Introduction générale aux travaux géodésiques et astronomiques primordiaux de la Mission. Notices sur les stations.** 27 pp.; maps. Ministère de l'Instruction Publique, Paris, 1913. 11 x 9.

As a result of proceedings initiated at the meeting of the International Geodetic Association in 1889 the French Government undertook the measurements of a new meridian arc in the highlands of Ecuador (see G. W. Littlehales: The Recent Scientific Missions for the Measurement of Arcs of the Meridian in Spitzbergen and Ecuador, *Bull. Amer. Geogr. Soc.*, Vol. 39, 1907, pp. 641-653). The expedition was in the field from 1901 to 1906 and, besides executing its primary object, was also able to make studies in the natural history, ethnography, and anthropology of the region. Results have been published as they have been worked up. The last part that has appeared

up to date, and one of the most interesting geographically, is the atlas of topographic surveys and plans. The observers at the triangulation stations were required to construct topographic surveys of their surroundings with a twofold object in view—for reconstruction of the site of the station and for study of the gravity action due to the mountain masses in the vicinity of the stations. Of the 78 stations of the first order the present atlas includes surveys of 41; twenty of the remainder will be included in the more extended surveys which will appear in the volume (not yet published) devoted to detailed triangulation of the region (for plan of triangulation see that accompanying the article by Littlehales).

The other volumes or parts of volumes that have already appeared are: Vol. 3, Part I, Angles azimutaux (1910); Part II, Compensation des angles, calcul des triangles (1912); Part VII, Latitudes astronomiques observées aux théodolites à microscopes (1910); Vol. 6, Ethnographie ancienne (1912); Vol. 9, Zoologie, Part I, Mammifères, oiseaux, trochilidés (1911); Part II, Reptiles, poissons, batraciens (1911); Part III, Mollusques, annélides, oligochètes (1910); Part IV, Actinies (1910-1912); Vol. 10, Entomologie, botanique, Part I, Hyménoptères, orthoptères, nevroptères, araignées. Vol. 6, Ethnographie ancienne, has been analyzed by Pierre Denis in *Ann. de Géogr. Bibliogr. Géogr. Annuelle* for 1912.

Brazil

Cherrie, G. K. **From Central Matto Grosso overland to the coast.** Map, ills. *Bull. Pan Amer. Union*, Vol. 46, 1918, No. 6, pp. 759-771. [A short note on a trip over the railroad recently constructed to Corumbá.]

Crandall, Roderic. **Notes on the geology of the diamond region of Bahia, Brazil.** Map, diagrs. *Econ. Geology*, Vol. 14, 1919, No. 3, pp. 220-244. Lancaster, Pa. [Containing some topographical description of the region.]

Farabee, W. C. **A pioneer in Amazonia: The narrative of a journey from Manaos to Georgetown.** Map, ills. *Bull. Geogr. Soc. of Philadelphia*, Vol. 15, 1917, No. 2, pp. 57-103. [Abstracted in the *Review*, Vol. 4, 1917, pp. 397-398.]

Giglioli, Italo. **Italiani e tedeschi nel Brasile; i Valdesi nell' Uruguay: Euconomia più che economia.** 29 pp.; bibliogr. Reprint from *L'Agricoltura Coloniale*, 1917, November 30. Florence. 9½ x 7.

Kappetein, P. C. **Bevolking en economische ontwikkeling van Brazilië.** *Tijdschr. voor Econ. Geogr.*, Vol. 8, 1917, No. 7, pp. 209-219.

Martin, P. A. **The influence of the United States on the opening of the Amazon to the world's commerce.** *Hispanic Amer. Hist. Rev.*, Vol. 1, 1918, No. 2, pp. 146-162. Baltimore.

Morize, H., and H. F. da Silva. **Results of geographic and magnetic survey of the southern part of Brazil, 1913-15.** *Terrestr. Magnet. and Atmosph. Electr.*, Vol. 21, 1916, No. 3, pp. 147-149.

Mossman, R. C. **Notes on the climate of the state of São Paulo, Brazil.** Map. *Quart. Journ. Royal Meteorol. Soc.*, No. 189, Vol. 45, 1919, pp. 53-63. London.

Mossman, R. C. **The rainfall of Fortaleza, Ceará, Brazil.** Diagr. *Quart. Journ. Royal Meteorol. Soc.*, No. 189, Vol. 45, 1919, pp. 69-79. London.

—— **Paraná, Geologia do Estado do.** Ills., bibliogr. *Bol. Minist. da Agric., Indust. e Commerc.*, Vol. 5, 1916, No. 1, pp. 67-143. Rio de Janeiro.

Pinto, E. R. **The Indians of Serra do Norte, Matto-Grosso, Brazil.** Map, ills., bibliogr. *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916*, Vol. 1, Section 1: Anthropology, pp. 358-362. Washington, D. C., 1917. [The Nambikuáras (Nhambiquaras). No reliable information on these Indians was obtained until Colonel Rondon's explorations in 1907. Later Colonel Roosevelt passed through the region. The author obtained there a great ethnographical collection in 1912.]

Rangel, Alberto. **Aspectos geraes do Brasil.** *Rev. Inst. Hist. e Geogr. Brasileiro*, Vol. 76, 1913, Part I, pp. 455-517. Rio de Janeiro, 1915.

Scherrer, Joseph. **Historisch-geographischer Katalog für Brasilien (1500-1908).** *Annaes Bibliotheca Nacl. do Rio de Janeiro*, Vol. 35, 1913, pp. 313-418.

Schuller, R. R. **A Nova Gazeta da Terra do Brasil (Newen Zeytung auss Presillg Landt) e sua origem mais provavel.** Map, ills. *Annaes Bibliotheca Nacl. do Rio de Janeiro*, Vol. 33, 1911, pp. 115-143.

STURZENECKER, G. R. **Contribuição para o estudo da orographia brasileira.** *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916,* Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 310-318. Washington, D. C., 1917.

ZEHNTNER, LÉO. **Estudo sobre as maniçobas do Estado da Bahia, em relação ao problema das seccas.** 113 pp., map, ills. *Inspectoria de Obras Contra as Seccas Publ. No. 41.* Rio de Janeiro, 1914.

LANE, GUILHERME, AND VIRGILIO PINHEIRO. ***Mappa do Estado de Alagoas.*** 1:500,000. *Inspectoria de Obras Contra as Seccas Publ. No. 44.* [Rio de Janeiro,] 1917. [Relief in brown shading; distinction between perennial and non-perrenial streams. Railroads, telegraph lines, and roads shown.]

RICE, A. HAMILTON. ***Survey of the Rio Negro, from Manáos to São Gabriel, Jan.-Mar., 1917.*** 1:750,000. Accompanying the article "Notes on the Rio Negro (Amazonas)" by A. Hamilton Rice, *Geogr. Journ.*, Vol. 52, 1918, No. 4, pp. 205-218 (map opp. p. 276).

EUROPE

THE LOW COUNTRIES, LUXEMBURG

SCHRIJNEN, JOS. **Nederlandsche Volkskunde.** xx and 316 pp.; diagrs., index. W. J. Thieme & Cie., Zutphen, [1915?]. 3 fr. 75. 9½ x 7.

The author is a member of the faculty of the Government University of Utrecht, and this work is a compilation of the superstitions, racial differences, and racial characteristics of the inhabitants of the Netherlands and may be said to have attained the pinnacle of thoroughness. No single phase of the curious details of Dutch life is omitted by the author, and it must regretfully be stated that his tedious volume, while scholarly in the extreme and having all the earmarks of careful research, goes far towards defeating the object he hopes to attain, that is the awakening of an interest in the customs of his native land.

Dr. Schrijnen is careful to explain in his introduction that the English conception of the word "folklore" must not be applied to the Dutch word "Volkskunde." Even here his passion for details comes to the fore, and his reader has to wade through a complete biography of the abused word, beginning with an issue of the British *Athenaeum* for 1846 in which is found an article by Mr. Thoms of the Camden Society wherein the word "folklore" is first used, and ending with the founding of the London Folklore Society in 1877. From "folklore" Dr. Schrijnen, by easy stages, drifts to "Volkskunde," which can best be translated by "ethnology," until he concludes by giving his personal definition of the word used in the title of his work. This definition is as follows—and the translation is literal—: "a systematic, rational study of the basis of culture. It is the ethnology of cultured races." In consequence, such students as take the definition seriously will be forced to coin a new word when they deal with the "ethnology of *savage* races," and it might be interesting to know what Dr. Schrijnen's word for this would be.

While "Nederlandsche Volkskunde" is more than tiresome, one has to pay a tribute to its author for the care with which he has compiled his information. To students of native games, for example, his classification of and exhaustive data on games of all kinds must prove of the greatest aid for purposes of reference. His chapter on the religious and heathen superstitions of all parts of the Netherlands is also exhaustive, and he traces back many of the old jingles and festive songs to their remote ancestry, thereby giving his reader a curious insight into the different races which went to make up the people of the Netherlands. In matters like these the book has decided merit; and, as the author has added a complete index, the volume will probably often be used for reference.

It would seem well-nigh impossible for Dr. Schrijnen to find enough material in the Netherlands of the kind included in this first volume to fill his promised second one, even though he mentions in his introduction that it will contain an "ethno-geographical chart in which the distribution of some folkloristic [the author's word] boundaries (dialects, place names, types of farmhouses, etc.) is indicated by decided lines, in order to see what results one can attain towards a more intimate knowledge of the racial division of the Netherlands."

THEODOOR DE BOOY

BEEKMAN, A. A. **De stormvloed van 13-14 Januari 1916.** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 3a, pp. 364-394.

BELLOC, HILAIRE. **The significance of Ardennes.** Maps. *Land and Water*, No. 2941, Vol. 71, 1918, Sept. 19, pp. 3-6. London.

BLANCHARD, RAOUL. **L'origine des moëres de la plaine maritime de Flandre.** *La Géographie*, Vol. 31, 1916-17, No. 5, pp. 337-342. Paris. [*Moëres*=meres, marshes.]

BLINK, H. **Economische geographie der Provincie Overijsel.** Maps. *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 3, pp. 89-128; No. 8, pp. 395-404. **De economische ontwikkeling van Overijsel in de laatste eeuw,** *ibid.*, No. 9, pp. 427-441. **Ontwikkeling der nederzettingen in Overijsel als economische centra,** *ibid.*, No. 10, pp. 478-490. The Hague.

BONGAERTS, M. **De kanalisatie van de Maas en haar economische gevolgen.** *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 1, pp. 5-14. The Hague.

DEMANGEON, A. **Anvers.** *Ann. de Géogr.*, No. 148-149, Vol. 27, 1918, pp. 307-339. [A study of its geographical *raison d'être.*]

LORIÉ, J. **Geologische beschouwingen over het eiland Voorne.** Map, diagrs., bibliogr. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 6, pp. 781-799.

MASSART, JEAN. **D'où vient la flore du littoral belge?** Map, diagr. *Ann. de Géogr.*, No. 137, Vol. 25, 1916, pp. 321-327. [The coast of Belgium, being of recent origin, affords a good field for the study of plant migration. The author's conclusion is that the Belgian species came from the south rather than from the north. A map, 1:25,000,000, of the vegetational regions of the greater part of Europe accompanies the paper.]

RUTGERS, H. **Daalt of rijst de bodem van Nederland?** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 4, pp. 467-480.

—— ***Ypres area, Map showing progress in the.*** 8th edit. 1:40,000. *Geogr. Sect. Genl. Staff* [*Map*] *No. 3588.* Ordnance Survey, [Southampton], Nov., 1917. [Relief in contours (interval 5 meters) and supplemental brown tints for 30-40, 40-50, 50-60, and above 60 meters. Lines of Allied advances from June 12 to November 17, 1917, shown in blue; also German trenches and other military works in red.]

BALKAN STATES, INCLUDING RUMANIA

GRAVIER, GASTON. **Les frontières historiques de la Serbie.** Preface by Émile Haumant. 164 pp.; maps. Librairie Armand Colin, Paris, 1919. 4 fr. 9 x 5½.

At the time of his gallant death at the front in 1915 Gaston Gravier had two major works in hand, the one on the natural regions of Serbia, the other on the territorial formation of the Serbian state (*Ann. de Géogr.*, Vol. 24, 1915, p. 456). The latter was completed save for a final revision and has now been published under the above title. Its primary interest is expressed in the author's own words (p. 4): "Serbia offers perhaps the most representative example of the type of state which has arisen and developed in that ill-defined, ill-differentiated zone where contact is established between two worlds profoundly different in race and civilization."

ALMAGIÀ, ROBERTO. **Tracce glaciali nelle montagne dell'Albania.** *Riv. Geogr. Italiana*, Vol. 25, 1918, No. 3-4-5, pp. 85-95. Florence.

BARNES, J. S. **The future of the Albanian state.** Map, ills. *Geogr. Journ.*, Vol. 52, 1918, No. 1, pp. 12-30 (discussion, pp. 27-30). [Part I is concerned with boundaries: "The first and fundamental principle here to be taken into consideration in the task of boundary delimitation is that of nationality, which in the case of Albania happily coincides with race and language"; Part II deals with the political future.]

DENIS, E. **La grande Serbie.** xiii and 336 pp.; maps, index. Librairie Delagrave, Paris, 1915. 3 fr. 50. 7 x 4½.

FAUCHER, D. **Contribution à la détermination des niveaux lacustres de la basse vallée du Vardar.** *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 168, 1919, No. 9, pp. 462-464.

FAUCHER, D. **Le Tikvèš.** *La Géographie*, Vol. 32, 1918, No. 4, pp. 226-230. Paris. [The ancient lake bottom occupying the angle between the Vardar and the Cherna in Macedonia.]

MUZET, ALPHONSE. **Le monde balkanique.** 314 pp.; map. Ernest Flammarion, Paris, 1917. 3 fr. 50. 7 x 5.

NEWBIGIN, M. I. **The problem of the South Slavs (Yugoslavs).** Ills. *Scottish Geogr. Mag.*, Vol. 35, 1919, No. 1, pp. 1-15.

NIOX, GENERAL. **Les pays Balkaniques.** 2nd edit. vi and 188 pp.; index. Librairie Delagrave, Paris, 1915. 2 fr. 50. 7 x 4½.

SUGAREFF, V. K. **The Bulgarian nationality of the Macedonians.** *Journ. of Race Devel.*, Vol. 9, 1919, No. 4, pp. 382-393. Worcester, Mass.

TAÜBER, C. [*sic*, i. e. TÄUBER, C.] **La mia traversata delle Alpi albanesi settentrionali.** Ills. *Riv. Mensile Club Alpino Italiano*, Vol. 35, 1916, No. 2, pp. 47-53; No. 3, pp. 81-85; No. 4, pp. 111-117. Milan.

WARING, L. F. **Serbia.** With a preface by J. M. Jovanovitch. 256 pp.; map, bibliogr., index. (Home University Library.) Henry Holt & Co., New York, 1918(?). 7 x 4½.

—— ***Europe, International map,*** 1:1,000,000. Sheet: ***North K 35, Istambul (Constantinople).*** Layered. Boundary revised Nov. 1918. *Geogr. Sect. Genl. Staff* [*Map*] *No. 2555.* War Office, London, 1918.

AFRICA

SOUTH AFRICA

MOLSBERGEN, E. C. G. **Reizen in Zuid-Afrika in de Hollandse tijd. Vol. 2: Tochten naar het Noorden 1686-1806.** xxxvii and 310 pp.; map, ills., bibliogr., index. (Werken uitgegeven door de Linschoten-Vereeniging, Vol. 12.) Martinus Nijhoff, The Hague, 1916. 10 x 7.

The Linschoten Society, founded in the Netherlands ten years ago, has most energetically carried on its purpose to print important and hitherto unpublished records of early travel by Dutch explorers. Its publications, thus far, embrace Dutch travels in the Arctic and the East Indies; Roggeveen's circumnavigation of the world from east to west in 1721-22, during which he discovered a considerable number of Pacific islands; the explorations of de Vries in parts of Europe and America; researches on the Guinea coast; and two volumes on the early Dutch expeditions into the interior of South Africa. In this, the second volume of the South Africa travels, we see the Dutch afield to the north of the Orange River, both in the interior of the continent and along the west coast as far north as Walfish Bay. The explorers found that both the giraffe and the elephant were already retreating to the north of the Orange River, as the natives who hunted them had been strongly reinforced by Dutch sportsmen.

The volume is well illustrated by clear and graphic drawings and a map of South Africa in the early days of its exploration. The work of the Linschoten Society, in rescuing from oblivion the important records it has thus far published, deserves the hearty appreciation of all geographers. CYRUS C. ADAMS

ALMEIDA D'ECA, VICENTE. **The economic resources of the territories of the Companhia do Nyassa.** *Trans. 3rd Internatl. Congr. of Tropical Agric. Held at the Imperial Inst., London, June 23-30, 1914*, Vol. 2, pp. 504-525. Internatl. Assoc. for Tropical Agric., London, 1917.

BEATTIE, J. C. **Further magnetic observations in South Africa during the years 1913-1915.** *Trans. Royal Soc. of South Africa*, Vol. 5, 1917, Part VI, pp. 669-670. Cape Town.

BLAAUW, F. E. **Waarnemingen op het gebied van dierengeografie in Zuid-Afrika.** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 6, pp. 890-903.

COX, G. W. **The intensity of rainfall in the Transvaal.** Map, diagrs. *South African Journ. of Sci.*, Vol. 12, 1915-16, No. 13, pp. 686-693. Cape Town.

CRABTREE, W. A. **Lake Bangweulu and its inhabitants.** Ills. *Journ. African Soc.*, No. 63, Vol. 16, 1917, pp. 216-226. London and New York. [A review of the works of the Swedish ethnologist, Eric von Rosen: Från Kap till Alexandria (Stockholm, 1912) and Träskfolket: Svenska Rhodesia-Kongo-expeditionens etnografiska forsknings resultat (Stockholm, 1916).]

DU TOIT, A. L. **The zones of the Karroo system and their distribution.** Map. *Trans. and Proc. Geol. Soc. of South Africa*, Vol. 21, 1918, pp. xvii-xxxvi. Johannesburg. [Presidential address at the annual meeting, March 21, 1918.]

EVANS, M. S. **The natives of Natal in relation to the land.** *South African Journ. of Sci.*, Vol. 15, 1918-19, No. 4, pp. 235-246. Cape Town. [A study of land tenure.]

GOULD-ADAMS, HAMILTON. **South-Central Africa.** 26 pp.; maps, ills. Reprinted from *Truth*, 1915, Sept. 19. Royal Geogr. Soc. of Australasia, Queensland. [Brisbane.]

HALL, A. L. **Asbestos in the Union of South Africa.** 152 pp.; map, diagrs., ills., bibliogr., index. *Geol. Survey of Union of South Africa Memoir No. 12.* Pretoria. 5s. 9½ x 6.

HETHERWICK, A. **Nyasaland to-day and to-morrow.** Ills. *Journ. African Soc.*, No. 65, Vol. 17, 1917, pp. 11-19. London and New York.

LACY, GEORGE. **South African exploration. Pioneer hunters, traders, and explorers of South Africa. The experiences of early travellers in Southwest Africa.** 28 pp. ("South Africa" Handbooks, No. 91.) Reprinted from *South Africa*, July, 1918. London. 6d. 6 x 5.

LEGAT, C. E. **Timber supplies and forestry in the Union.** *South African Journ. of Sci.*, Vol. 15, 1918-19, No. 2, pp. 79-99. Cape Town.

MASON, M. H. **The Transkei.** Map, ills. *Geogr. Journ.*, Vol. 52, 1918, No. 1, pp. 30-43 (discussion, pp. 41-43).

PHILLIPS, E. P. **A note on the flora of the Great Winterhoek Range.** *South African Journ. of Sci.*, Vol. 15, 1918-19, No. 4, pp. 226-234. Cape Town. [A study of the vegetation existing under mountain conditions.]

RANGE, PAUL. **Ergebnisse von Bohrungen in Deutsch-Südwest-Afrika.** 137 pp.; map, ill. *Beiträge zur geol. Erforschung der Deutschen Schutzgebiete No. 11.* Berlin, 1915.

RINDL, M. M. **The medicinal springs of South Africa: Supplement I.** *South African Journ. of Sci.*, Vol. 15, 1918-19, No. 4, pp. 217-225. Cape Town. [The continuation of a paper with the same title which appeared in the June, 1917, issue of this journal.]

ROGERS, A. W. **Namaqualand.** *South African Geogr. Journ.*, Vol. 1, 1917, No. 1, pp. 23-33. Johannesburg.

SIM, T. R. **The black wattle industry.** *South African Journ. of Sci.*, Vol. 13, 1916-17, No. 7, pp. 279-301. Cape Town. [In past years large quantities of the tanning material, black wattle bark, have been exported from Australia. Today a practical monopoly of the export is held by Natal, where, through an unusually fortunate combination of circumstances, the industry is in a flourishing condition. Climate, soil, and labor are all conducive to its success. Labor, cheap in Natal, is prohibitive in cost in Australia and New Zealand. Areas in the Cape otherwise suitable may better be devoted to cattle raising, as in the United States alfalfa and fruits are more profitable in the sections where climatic conditions are right for wattle cultivation. Heretofore the Natal bark has been exported overseas; now with the development of a South African meat export trade and opportunity for the scientific handling of hides the product may be used at home.]

TÖNNESEN, T. **The South-West Africa Protectorate.** Map, ills. *Geogr. Journ.*, Vol. 49, 1917, No. 4, pp. 282-300.

WAGNER, P. A. **The mineral industry of the Union of South Africa and its future.** Map. *South African Journ. of Sci.*, Vol. 15, 1918-19, No. 2, pp. 45-78. Cape Town.

ASIA

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

LEE, J. C. H. **The manual for topographers: Philippine Department, United States Army, 1915.** 117 pp.; diagrs. *Occasional Papers No. 52.* Engineer School, U. S. Army, Washington Barracks, D. C., 1917. 9 x 6.

Military surveys in the Philippine Islands have been in operation almost from the beginning of the American occupation. Their object is to furnish reliable maps of all territory suitable for military operations in the archipelago. Geographical positions are referred to the Luzon datum of the Coast and Geodetic Survey. The main control is triangulation of tertiary or higher accuracy. A polyconic projection is used; scale 2 inches to 1 mile; contour interval, 20 feet. In trail work where limited topography is shown the scale is reduced to 1 inch to 1 mile, and in mountainous country the contour interval may be 100 feet.

In addition to explanation of the policy, organization, standards, and methods of the survey and its relations to the civil government, Captain Lee's manual includes care and adjustment of instruments, field triangulation, control traverses, needle traverses, differential leveling, azimuth, topography, the elevation datum, time, suggestions to computers, mess and ration accounts, sanitation, and definitions. Sample forms for all records are shown and in the appendixes are reproduced various necessary tables. JAMES GORDON STEESE

LEKKERKERKER, C. **Land en Volk van Sumatra.** x and 368 pp.; map, diagrs., ills., index. E. J. Brill, Leiden, 1916. 7.50 gulden. 10 x 7.

A few years ago the Royal Colonial Institute of the Netherlands offered a prize for the best handbook describing the resources and ethnology of the island of Sumatra, the Institute being desirous of calling the attention of the outside world to the growing importance and the latent possibilities of this westernmost outpost of the Dutch East Indian archipelago. This prize was awarded to Mr. C. Lekkerkerker, a former school inspector of the colonial government and the keeper of the archives of the Bali Institute.

There can be no doubt that the author's "Geography and Ethnology of Sumatra" is an exhaustive treatise. It bears all the earmarks of accurate and painstaking compilation. At times, in fact, the work becomes trite through its very completeness, and Mr. Lekkerkerker's many years of teaching appear to have tainted his spirit with a desire to drum knowledge into his reader's mind by constant repetition. No user of a geographical handbook can consider that his intelligence is being complimented when he has to wade through a lengthy description of the exact manner in which a mangrove tree spreads its roots and acts as a trap for alluvial river mud (p. 6), nor does he particularly care to be told that coconut shells, when filled with rain water, are a menace to public health because they offer a breeding place for the larvae of mosquitoes (p. 105).

Despite this drawback, the author has filled his handbook with valuable information. When one considers that at the present time Sumatra is cultivated only to the extent of two or three per cent of its area and could readily sustain twenty times its present population, it will be seen that this information may not come amiss to intending developers of the resources of the island. The petroleum deposits, the coal mines, the rubber lands, and many other possibilities are attractive openings for foreign capital cited by Mr. Lekkerkerker.

The author is happier in his ethnographic description of the island. The ethnological student finds much of interest. The enumeration and classification of the numerous tribes comprising the 5,000,000 inhabitants of Sumatra are not only of high value but are a pioneer effort at a systematic ethnological census of the indigenous races.

The author adds a brief résumé of Sumatra's history and settlement by white colonizers and gives an insight into the causes of the war between the Dutch government and the inhabitants of Atjeh, the northern part of the island.

A clear and excellent map of Sumatra (1:2,500,000) accompanies the volume. Two insets, one of the geological formation (1:7,500,000) of the entire island and one of the agricultural areas now under development on the eastern coast (1:1,500,000), are also especially good. THEODOOR DE BOOY

ABENDANON, E. C. **Historische geologie van Midden-Celebes.** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 3, pp. 440-456; No. 4, pp. 548-564.

ANDERSON, ISABEL. **The spell of the Hawaiian Islands and the Philippines.** xiv and 373 pp.; maps, ills., bibliogr., index. (The Spell Series.) Page Co., Boston, 1916. $2.50. 8 x 5½.

BARTON, R. F. **Ifugao law.** 127 pp.; map, ills., glossary. *Univ. of California Publs. in Amer. Archaeol. and Ethnol.*, Vol. 15, 1919, No. 1. Univ. of California Press, Berkeley. 11 x 7. [This treatise consists principally of an ethnological study of customs among the Ifugaos, as related to their tribal law. These people, a Malayan hill tribe, inhabit an isolated section in the center of northern Luzon. They are a sedentary race, with a highly developed terrace agriculture and extensive irrigation for the cultivation of rice. Yet they have no political government, no officers of the law, no courts, no judges. Their social relations, tenure of property, and even financial dealings are regulated by custom, which is so strong and so universally complied with that they have long maintained a fair degree of order in their district without interference on the part of Spanish or American authorities.]

CHU, CO-CHING. **Some new facts about the centers of typhoons.** Diagr. *Monthly Weather Rev.*, Vol. 46, 1918, No. 9, pp. 417-419. Washington, D. C.

D'ALMONTE, ENRIQUE. **Formación y evolución de las sub-razas indonesia y malaya.** Diagrs., ills., bibliogr. *Bol. Real Soc. Geogr.*, Vol. 59, 1917, No. 1, pp. 7-109; No. 2-3, pp. 129-321; No. 4, pp. 398-478. Madrid.

HEISER, V. G. **American sanitation in the Philippines and its influence on the Orient.** *Proc. Amer. Philos. Soc.*, Vol. 57, 1918, No. 1, pp. 60-68. Philadelphia.

HOUWINK, L. **De artesische boringen in het bekken van Batavia.** *Tijdschr. Kon. Inst. van Ingenieurs Afdeeling Neder.-Indië*, 1914, No. 2, pp. 5-12. Batavia.

MAGALHAES, A. L. DE. **A ilha de Ataúro (Província de Timôr): Noticia sôbre a ilha e seus habitantes.** *Bol. Soc. de Geogr. de Lisboa*, Ser. 36, 1918, No. 1-3, pp. 53-70; No. 4-6, pp. 164-178. [Ataúro, usually called Cambing (or Kambing), is a small island lying just north of Timor in the Portuguese East Indies. The writer gives a description of the physical features of the island, its resources, people, etc.]

MOLENGRAAFF, G. A. F., AND OTHERS. **De geologie van het eiland Letti.** (Nederlandsche Timor-Expeditie 1910-1912.) Ills., index, bibliogr. *Jaarboek van het Mijnwezen in Nederl. Oost-Indië*, Vol. 43, 1914, Part I, pp. 1-232. The Hague.

—— **Philippine Islands, Report of the Governor General of the, to the Secretary of War, 1917.** iv and 188 pp.; index. Washington, D. C., 1918.

—— **Philippine Islands, The mineral resources of the, for the year 1915.** 39 pp.; map, diagrs., ills. Division of Mines, Bur. of Sci., Manila, 1916.

—— **Philippine Islands, The mineral resources of the, for the year 1916.** 31 pp.; maps, diagr., ills. Division of Mines, Bur. of Sci., Manila, 1917.

RABOT, CHARLES. **L'œuvre géographique des Néerlandais en Malaisie.** *La Géographie*, Vol. 32, 1918, No. 1, pp. 10-19. Paris. [A summary of recent work.]

SMITH, HARRISON W. **Sarawak: The land of the white rajahs.** Map, ills. *Natl. Geogr. Mag.*, Vol. 35, 1919, No. 2, pp. 110-167.

SMITH, WARREN D. **Geologic and physiographic influences in the Philippines.** Maps, ill. *Bull. Geol. Soc. of America*, Vol. 28, 1917, No. 3, pp. 515-542. [Physiographic conditions are invoked—here and there a little too plausibly—to explain human development. The response of Manila to its physical environment is especially worth noting. The city is built at a point where sea, plain, lake, and river are in juxtaposition, a combination rare in the islands. The Pasig River is the main artery to the rich lake country to the southeast. The plain affords not only excellent agricultural land but, built of alternating loose pyroclastics and shales, has an exceptionally good supply of artesian water. The bay, with narrow outlet and wide flaring interior, is one of the safest (from seismic disturbance) and best protected in the world. In its broader relations Manila also occupies an enviable position in the Orient, being in close touch with Malaya and midway between the rich plains of China and the growing continent of Australia.]

—— ***Coron Bay, Philippine Islands, Western entrance to.*** 1:50,000. *U. S. Coast and Geodetic Survey Chart No. 4350.* Washington, D. C., Jan., 1919.

—— ***Cuyo Islands, Philippine Islands, Anchorages in.*** (1) ***Cuyo Islands, Cuyo Anchorage, and Bisucay Channel,*** 1:10,000, from surveys of 1912; (2) ***Cuyo Islands, Tagauayan Islands,*** 1:10,000, from surveys of 1915. *U. S. Coast and Geodetic Survey Chart No. 4336.* Washington, D. C., Sept., 1918.

—— ***Cuyo Islands, Philippine Islands.*** 1:100,000. *U. S. Coast and Geodetic Survey Chart No. 4312.* Washington, D. C., March, 1918.

—— ***Shark Fin Bay to Flechas Point, Northeast coast of Palawan, Philippine Islands.*** [1:100,000.] *U. S. Coast and Geodetic Survey Chart No. 4317.* Washington, D. C., April, 1918.

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

TAYLOR, GRIFFITH. **The Australian environment (especially as controlled by rainfall).** 188 pp.; maps, diagrs., bibliogr. *Commonwealth Advisory Council of Science and Industry Memoir No. 1.* Melbourne, 1918.

For no part of the world have we at the present time so clear, so practical, so complete, and so useful a series of climatological and meteorological studies as that which is available for the Commonwealth of Australia. Under the able direction of Mr.

Henry A. Hunt, Commonwealth Meteorologist, the Australian Bureau of Meteorology has issued a set of regular reports and of bulletins in which that bureau may well take pride and for which the climatologists of the world are under deep and lasting obligations. In recent years Dr. Griffith Taylor, physiographer in the Commonwealth Bureau of Meteorology, instructor at Melbourne University, and lecturer at the Commonwealth Flying School, has been especially active in presenting the larger facts, as well as the details, of Australian climatology and meteorology in an original and remarkably successful manner. In his latest publication on "The Australian Environment" he gives us a regional study of the topography, drainage, vegetation, settlement, and of the character and origin of the rains, which is not only indispensable to all who are in any way concerned with the region with which it deals, but may well serve as a model and as an inspiration for those who are attempting similar studies of other parts of the world. The appearance of this report at the present time is due to the generosity of the Advisory Council of Science and Industry in providing the money to have it printed.

"The Australian Environment" is the third of a series dealing with the climatic control of settlement in Australia. The first was published in 1916, as *Bulletin No. 14*, "The Control of Settlement by Humidity and Temperature" (see *Geogr. Rev.*, Vol. 4, 1917, pp. 401-403, and Vol. 5, 1918, p. 86). The second, *Bulletin No. 11*, discussed the control exercised by rainfall and temperature on the three chief products of Australia—cattle, sheep, and wheat (see *Geogr. Rev.*, Vol. 1, 1916, p. 396). In this an estimate was made of the probable extension of these industries in the future.

The fundamental conception of the author in the present monograph is concerned with the rains of Australia. The sun causes migrations ("surges") in the "moisture belt" of the atmosphere. This belt is broken into the various storm systems, which actually bring the different types of rainfall. A discussion of the topography and of its evolution is included for the reason that the surface features are largely the result of the action of the falling rain and of its consequent drainage and also, in their turn, control the general distribution of the rainfall. The natural vegetation depends primarily upon this rainfall and prepares the way for man's occupation. Finally, a study of man's experience in similar natural regions elsewhere leads to a summary of the industrial and hygienic aspects of the Australian region. This sequence of thought is the framework upon which the whole study is built up.

The sun being the fundamental control upon which all the other conditions depend, a simple, original, and very ingenious cardboard "solar control model" has been devised, which, when properly cut out and adjusted, shows, month by month, the winds, pressure, storms, and rains which prevail over Australia. The migrations of the tropical rain belt, and of the other varying atmospheric phenomena which oscillate in unison with the movement of the sun, are admirably shown by means of this model, which emphasizes, in a very striking way, the interdependence of meteorological phenomena. The centers of pressure and their accompanying winds swing slowly 1,000 miles north and the same distance south during the year, at the same time having a general west-to-east progression of about 400 miles a day. Dr. Taylor well points out that the former slow movement determines the *climate*, while the latter, with its local oscillations and stoppages, controls the *weather*.

A new and interesting chart is that which shows rain reliability (Fig. 5), on which are indicated the percentage variations from the normal annual rainfall (1891-1910). This shows where the rains are likely to agree with the average rainfall and is of great value in forecasting. By means of it the possibility of agriculture in various parts of the continent can be deduced. Another original map is that of the zones of rainfall uniformity (Fig. 7). This does not take account of fluctuations but of averages, the lines showing the number of months during a year which receive over one inch of rainfall. The area with over one inch of rainfall during 12 months is confined almost wholly to the southeast. These rainfall maps are directly followed by a vegetation map, based on the German map by Diels, a comparison of which with the preceding rainfall maps shows a remarkably close correspondence.

The "climograph," previously discussed by Dr. Taylor in *Bulletin No. 14* of the Commonwealth Bureau of Meteorology (see this *Review*, Vol. 5, 1918, p. 86), is used to correlate the various types of Australian climate with those of other parts of the world, and deductions are made as to the probability of settlement of various districts by white men and as to the crops which are most likely to succeed. This is a practical problem of immediate and future economic and political importance in connection with the settlement of the tropical parts of Australia. A similar graphical method, named the "hythergraph," enables one to study the distribution of plant life.

The last 150 pages of the memoir are taken up with detailed regional studies. The country is divided into fifteen major regions on the basis of rainfall. For each section

there is a study of the physiography; vegetation; origin, distribution, and effects of the rains; health; economics, etc. These pages contain the first detailed study of the physiography of the whole of Australia and are accompanied by colored contour maps not previously published for most of tropical Australia. An outstanding feature of this regional discussion is the large series of weather maps, illustrating the various types of rains occurring in each section. We have never had a study of Australian rainfall types so complete as the present one. Mr. Henry A. Hunt's "Types of Australian Weather" (1896) was, however, a valuable and worthy predecessor.

It is quite impossible to give a summary of Dr. Taylor's very exhaustive study. He has given us a monograph of real and permanent value. He has made his writing interesting, in spite of the many details with which he deals, because he is keenly alive to every human response to the climatic and topographic environment. It would be well for all students of geography if there were many more such investigations, carried out by authors as competent as is Dr. Taylor and as thoroughly sympathetic with the broader aspects of the subjects with which they are dealing. R. DEC. WARD

BEST, ELSDON. **The land of Tara and they who settled it: The story of the occupation of Te Whanga-nui-a-tara (the great harbour of Tara) or Port Nicholson, by the Maori.** Diagr. *Journ. Polynesian Soc.*, Vol. 26, 1917, No. 4, pp. 143-169; Vol. 27, 1918, No. 1, pp. 1-25; No. 2, pp. 49-71; No. 3, pp. 99-114; No. 4, pp. 165-177; Vol. 28, 1919, No. 1, pp. 1-17. New Plymouth, N. Z.

COTTON, C. A. **Mountains.** Ills. *New Zealand Journ. of Sci. and Technol.*, Vol. 1, 1918, No. 5, pp. 280-285. Wellington. [Brief summary of the author's work on the evolution of the mountains of New Zealand.]

MAYER, A. G. **Ecology of the Murray Island coral reef.** Maps, diagrs., ills. *Papers from the Dept. of Marine Biology of the Carnegie Inst.*, Vol. 9, 1918, pp. 3-48. Washington, D. C.

OSTENFELD, C. H. **Contributions to West Australian botany. Part II.** 66 pp.; map, diagr., ills. *Dansk Botanisk Arkiv*, Vol. 2, 1918, No. 8. Copenhagen. 4 kroner. 9½ x 6½. [Part I of this study, which contains some phytogeographic material, is noted in the *Review*, Vol. 2, 1916, p. 483.]

—— ***New South Wales, Geological map of.*** [1:1,137,760.] Prepared under the direction of E. F. Pittman, Government Geologist, Department of Mines. Inset: Australia, showing positions of Lord Howe and Norfolk Islands, 1 in. to 400 miles. Department of the Interior, Sydney, 1914.

—— ***New South Wales, Physical map of.*** [1:1,137,760.] Department of Lands, Sydney, 1915. [Hypsometric map with elementary hachuring (practically only for the divides) and three very general tints of brown for altitudes of 0-2,000, 2,000-3,000, and over 3,000 feet.]

—— ***New South Wales railways, Map of,*** showing coach and other routes from the various stations, together with mileage from Sydney, with diagrams of North Coast, South Coast, and parts of Southern and Western lines. 1 inch to 29 miles (1:1,837,440). Department of Lands, Sydney, 1918.

—— ***Trans-Australian Railway, Commonwealth Railways map shewing route of.*** [1:1,300,000.] Commonwealth Railways, [Melbourne,] 1918.

POLAR REGIONS

ARCTIC

—— **Baffin Bay and Davis Strait, Monthly meteorological charts of.** Published by authority of the Meteorological Committee. 1 page of text and 12 plates of maps. *Meteorological [Publ.] No. 221.* London, 1916.

The discussion during the past few years of the feasibility of the Hudson Bay steamship route has directed popular as well as scientific attention to the meteorological conditions of the whole northeastern portion of the North American continent and of its adjacent water areas and especially to the controls which the winds and the weather have over the amount of ice and its movement. The publication of the "Monthly Meteorological Charts of Baffin Bay and Davis Strait" was undertaken by the British Meteorological Office at the request of the Board of Trade and on the recommendation of the Conference on Ice Observation Vessels convened by that board in November, 1912. The data upon which the charts are based were obtained from logs kept

especially for the Meteorological Office on board of exploring and whaling vessels. There are twelve charts, covering the six months May to October. For the remaining six months no data are available, or the data are insufficient. Six charts show the winds, pressure, air and water temperatures, and surface currents; the remainder give the available information with regard to the state of the ice in Davis Strait and Baffin Bay. In all about 39,000 sets of observations were used. Many facts of scientific as well as of practical interest are brought out and emphasized in the text. The winds most characteristic of the bay and strait are southeast and northwest, i. e. either up or down these bodies of water. Gales are associated with the passage of cyclonic depressions traveling, almost invariably, from west to east. The information regarding the currents may be considered particularly reliable. It is noteworthy that the Labrador Current, which is largely caused by the action of winds from the northward in the higher latitudes, is a good deal accelerated by the northerly winds which are frequent in these regions during most of the year. In contrast with the ice-congested area, which impedes or bars navigation in the bay and in the northern part of Davis Strait during three of the six months covered by the present charts, there are certain relatively ice-free sheets of water in summer and early fall in various parts of Baffin Bay or its tributaries. These are probably due to the upwelling of an undercurrent of oceanic origin from the south. Field ice is the most frequent form of ice in Baffin Bay and Smith Sound, while in Davis Strait the respective frequency of field, drift, and berg ice is about equal.

Regarding the charts themselves, it may be said that they present the available facts clearly and in great detail. Anyone who examines them, even in a cursory manner, cannot fail to be impressed by the large amount of meteorological and oceanographical information now available concerning these northern water areas, which are probably regarded by many persons as still practically unknown. The charted information in several cases extends as far as 80° N. From the practical point of view of the navigation of Hudson Strait it is, of course, disappointing that the words "no information," or "insufficient data," appear on several of the charts. For July and August, however, a fair amount of meteorological material is available right through to Hudson Bay.

It is, perhaps, not out of place to call attention to an important monograph, published ten years earlier than the charts reviewed above and dealing with the same area, by Dr. Ludwig Mecking, entitled "Die Eistrift aus dem Bereich der Baffin-Bai beherrscht von Strom und Wetter" (*Veröffentlichungen des Inst. für Meereskunde . . . Univ. Berlin*, No. 7, Jan., 1906). A comparison between the effects of currents and of wind on drift ice, based upon theoretical calculation, as well as upon empirical facts, is followed by a very detailed discussion of the ice drift in Baffin Bay as dependent upon currents and upon weather conditions, as evidenced by observation. The currents in Baffin Bay, as well as in the adjacent areas of Davis Strait, Hudson Bay, Melville Sound, etc., and extending as far as the Gulf of St. Lawrence on the south and the southeastern coast of Greenland on the east, are clearly shown on an excellent chart. Further, a series of small charts shows the isobars for the months of July and August preceding certain years whose ice conditions were selected for special study. A comparison between the prevalence of icebergs and of floe ice in each year and of the accompanying weather is made by means of a series of curves. The general weather conditions of the preceding summer were found to be the controlling factor in determining the amount of ice of glacial origin in the region under discussion, while the amount of floe ice is determined by the pressure gradient in the preceding November-January between southern Greenland and the mouth of the St. Lawrence River.

The first of the two publications here reviewed is essentially cartographic. The second is a very full discussion, with a minimum of maps. Together they give a large and important body of material on the ice of the Baffin Bay region. R. DEC. WARD

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